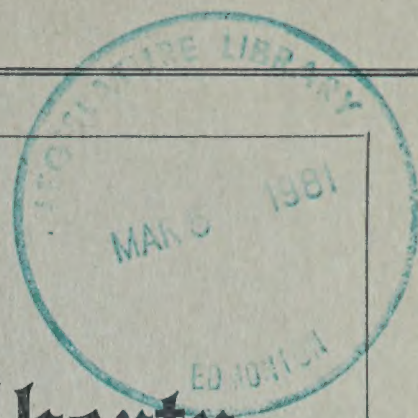


CA2A2QG  
50H22  
April 13/50  
Vol 20



# The Province of Alberta

## PETROLEUM AND NATURAL GAS CONSERVATION BOARD

IN THE MATTER OF THE GAS RESOURCES PRESERVATION ACT

AND IN THE MATTER OF the application of Westcoast Transmission Company Limited and Westcoast Transmission Company Ltd. (Alberta Incorporation) for a permit authorizing the purchase and sale of Natural Gas in the Province of Alberta for transmission to points in the Province of British Columbia and the States of Washington and Oregon in the United States of America.

I. N. McKinnon Esq., Chairman

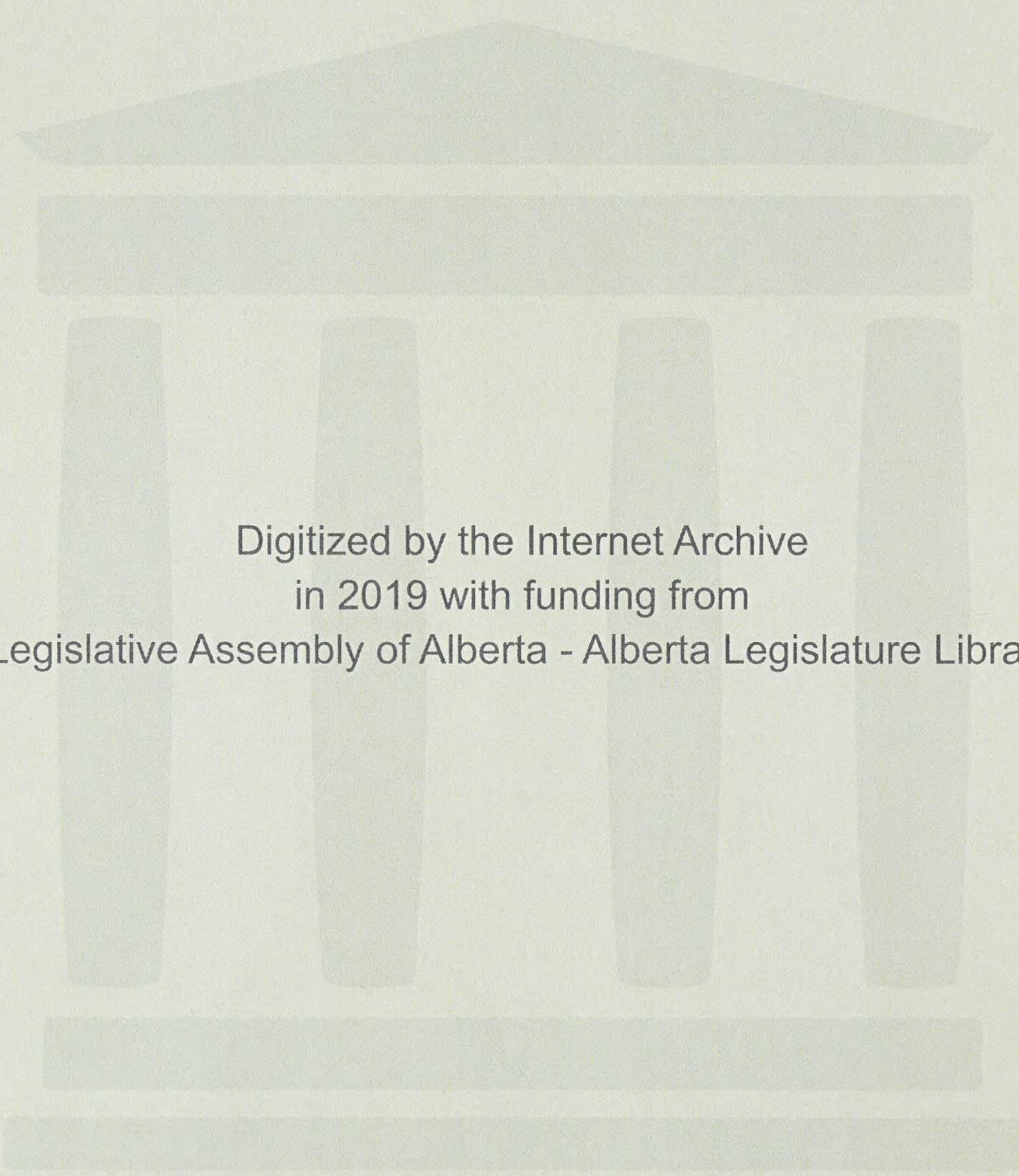
D. P. Goodall Esq.

Dr. G. W. Govier

**Session:** APRIL 13th, 1950.

**Volume** 20





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VOLUME 19.

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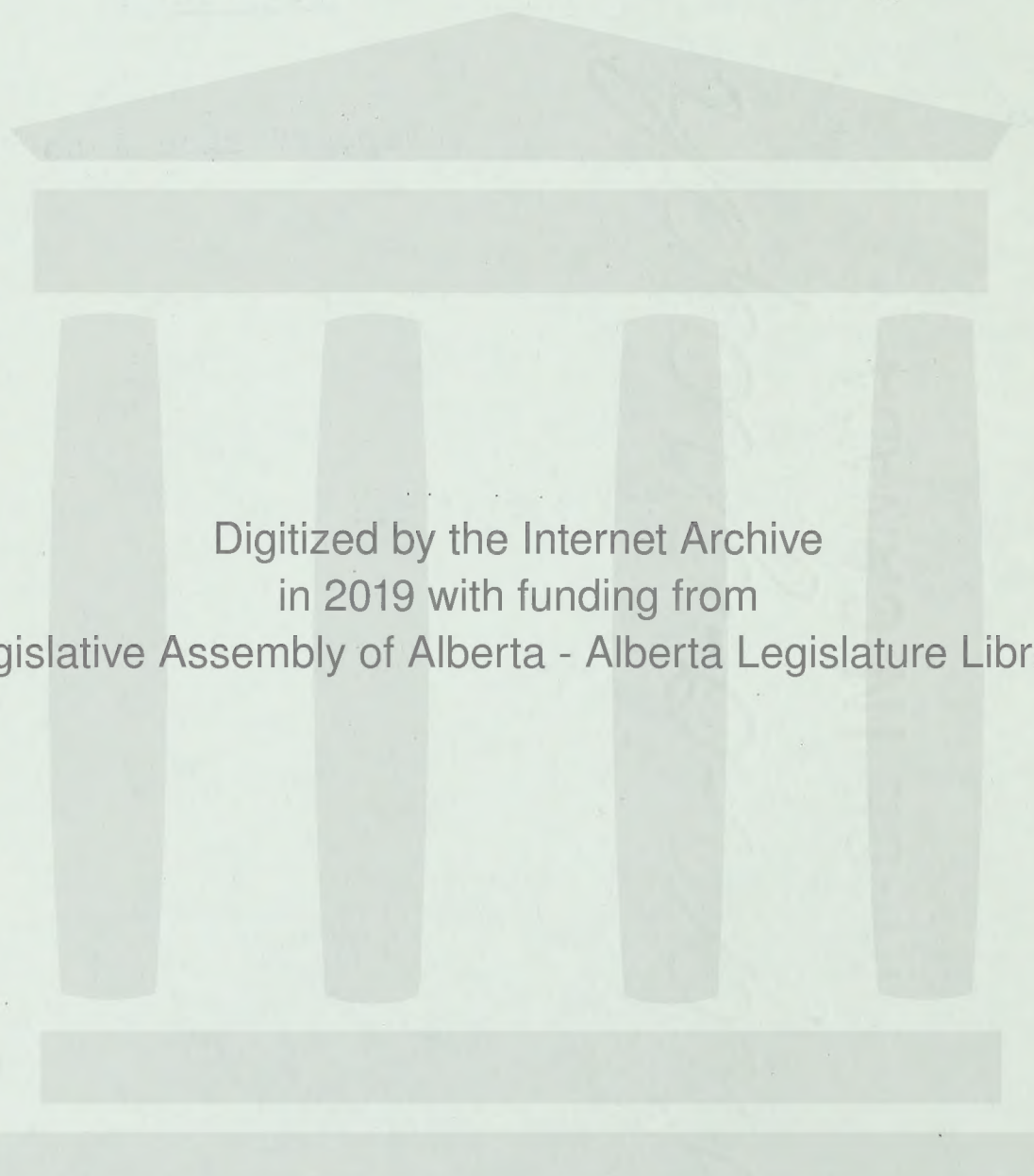
Line

Correction

1388

13

"Vapour" should be "raising".



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I N D E X

VOLUME 20.

April 13th, 1950.

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Section 1

1961

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1. The first part of the report is devoted to a general survey of the situation in the country. It is followed by a detailed analysis of the economic situation, which is characterized by a steady decline in the standard of living of the population. The report also mentions the political situation, which is described as being unstable and prone to change.

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2. The second part of the report is devoted to a detailed analysis of the economic situation. It is followed by a detailed analysis of the political situation, which is described as being unstable and prone to change. The report also mentions the social situation, which is described as being unstable and prone to change.

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3. The third part of the report is devoted to a detailed analysis of the economic situation. It is followed by a detailed analysis of the political situation, which is described as being unstable and prone to change. The report also mentions the social situation, which is described as being unstable and prone to change.

Section 2

1991

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4. The fourth part of the report is devoted to a detailed analysis of the economic situation. It is followed by a detailed analysis of the political situation, which is described as being unstable and prone to change. The report also mentions the social situation, which is described as being unstable and prone to change.



VOLUME 20April 13th, 1950.

THE CHAIRMAN:

Before we start proceedings this morning the Board would like to suggest that we have sittings in the afternoon today and tomorrow. We suggest we might sit from 9.30 to 12.00 and from 2.00 to 4.30. We think there is quite a bit of work to get through and we would like to get cleaned up tomorrow, if possible. If Counsel have no objections, we will do that.

MR. McDONALD:

Quite satisfactory to the applicant.

MR. FENERTY:

Well, perhaps I should interject here. When you say "get cleaned up", I take it this Inquiry is going to remain open, and perhaps other evidence given, because this might be an opportune time for me to mention something to the Board, which I think may prolong it some, but may be of some help. I haven't any doubt that this Board has more knowledge of the relevant conditions in Alberta than all the rest of us put together, but I think perhaps all parties would agree that it is desirable that all of the facts that are known and which might influence a decision should be known to all of the parties. To that end I am going to ask that before this Inquiry is terminated that the Board, either of its own volition, or that I, with the Board's permission, may call those experts and engineers other than the members of the Board sitting here who are employees of this Board to give us all facts within the knowledge of the Board as shown by their records, favourable or unfavourable to export, favourable or unfavourable to gas reserves, and how they can be obtained. I do not care



THE CHAIRMAN:

this morning the Board would like to suggest that we  
sit in the afternoon today and tomorrow. We might  
sit from 8.30 to 12.00 and from 2.00 to 4.00.  
I think there is quite a bit of work to get through and  
would like to get cleaned up tomorrow, if possible.  
I think we have no objections, we will do that.

MR. McDONALD:

Quite satisfactory to the Board.

MR. TERRY:

Well, perhaps I should inter-  
vene. When you say "get cleaned up," I take it this is  
is going to remain open, and perhaps other evidence  
because this might be an opportunity time for me to make  
something to the Board, which I think may be along the  
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knowledge of the Board as shown by their records, favourable  
or unfavourable to export, favourable or unfavourable  
and reserves, and how they can be obtained. I do not



at this stage what the result is, but I do feel that all of us sitting here should have and be able to deal with the facts within the knowledge of the Board sitting there, and I make that suggestion at this date, so that if the Board does accede to it before the matter is finished that material can be put into the form that will be available.

THE CHAIRMAN: We intend to make an announcement tomorrow to that effect. We have discussed with the Counsel of the various applicants this morning the question of putting on the Board's engineers on the stand, and we have agreed that it will be done at a joint session after the other applications have been heard, and we think now that that may be about the end of October, but we will make an announcement on that tomorrow.

MR. FENERTY: Probably it is eminently desirable that that information could be given after the other evidence is in.

THE CHAIRMAN: Yes.

MR. FENERTY: But I was only mentioning it now. And then also I understood from what was said about finishing this week, we are not going to get to this question of costs that I am still pursuing, and that is another reason why I am anxious to know that the thing will be done, and we will have the other evidence.

THE CHAIRMAN: Yes.

MR. McDONALD: I will now call Mr. Brownie.

.....







F. A. Brownie,  
Dir. Ex. by Mr. McDonald.  
Cr. Ex. by Mr. Fenerty.

- 1441 -

FRANK AUSTIN BROWNIE, recalled,  
having already been sworn, examined by Mr. McDonald, testified  
as follows:-

Q Mr. Brownie, just to sum up the position with regard to  
Canadian Western, the matter of future supplies of gas,  
as I understand your exhibit, it will be necessary for the  
season 1951-52 to provide an additional source of supply?

A That is correct.

Q On the assumption that that additional source of supply  
would be Jumping Pound, am I right, that in approximately,  
in a relatively short term of from five to seven years  
an additional supply again will be required to provide for  
peak loads?

A Yes.

Q Thank you. Answer other Counsel, Mr. Brownie.

.....

CROSS-EXAMINATION BY MR. FENERTY:

Q Just a couple of questions, Mr. Brownie. In Exhibit 96  
you referred to an estimate by Ralph Davis of 400 billion  
cubic feet at Jumping Pound. I have an impression  
somehow that that same Ralph Davis - oh, by the way, I  
believe he is an outstanding authority in the States?

A I believe that to be the case, yes.

Q He has also estimated Viking-Kinsella field at 600 billion  
feet as of 1948, is that correct?

A That is correct.

Q Yes. Now, has the Canadian Western Company, or the Company  
that you are associated with, any other information that  
might be of value to this Board and to ourselves as to  
reserves, because if you have we would awfully well like







F.A. Brownie,  
Cr. Ex. by Mr. Fenerty

- 1442 -

to have it, you know, we are all trying to be helpful.

A We have an estimate from Ralph Davis of the reserves in the group of fields south of Foremost.

Q Yes?

A I think that is all. We have estimates by him on Bow Island, of course, and Foremost and Turner Valley.

Q You know, of course, that on other inquiries Mr. Stanley Davies has given some evidence, notably before the Dinning Commission, as to his estimates, and I am glad to know that he is not alone in his figures, Mr. Brownie?

A Yes, I knew that.

Q Geologists and engineers not associated with these applications apparently have made much more conservative estimates, that is a fact, isn't it?

A It appears to be.

Q Yes. Now, you also mentioned in Exhibit 42 that in addition Northwestern is in the course of working out a contract with the Imperial Oil Limited with regard to the purchase of gas in the Leduc field. Now, I don't want to ask you about it, or ask you too much about something that is still in the negotiation form, but I will content myself with this, as a matter of fact, have you concluded a contract with them?

A No, not yet.

Q Not yet?

A No.

Q You are still negotiating?

A Yes.

Q Thank you.

.....







F. A. Brownie,  
Cr. Ex. by Mr. Frere

- 1443 -

CROSS-EXAMINATION BY MR. FRERE:

Q Mr. Brownie, just a question or two. In your supplementary statement to Exhibit 42 you mentioned that the total daily deliverability of the Turner Valley Calgary system is now 135 million cubic feet, and you stated further that should the weather be such in the winter of 1950-51 that the potential peak of 151 million is actually experienced, sufficient load could be dumped to insure the supply to domestic consumers would not be endangered. What part of the load would be dumped, the industrial load or the commercial load?

A The industrial.

Q The industrial load?

A Yes.

Q And would you curtail the gas supplied to the industrial users pro rata?

A We might or we might not, Mr. Frere. It is a matter of practical operation. Certain of the larger ones are much more easily curtailed and with greater effect than some of the smaller ones.

Q Would you, for instance, curtail the supply to the Victoria Power plant or the Lethbridge steam plant?

A Yes, we might.

Q You might?

A Yes.

Q It is my understanding that the Victoria plant has recently been converted for the use of gas, is that right?

A That is correct.

Q And also that the Lethbridge steam plant is now in the process of being converted for gas consumption?







F. A. Brownie,  
Cr. Ex. by Mr. Frere

- 1444 -

A Yes.

Q Knowing of the insufficient supply of gas or the incapacity of the Turner Valley-Calgary system, what is the policy of your Company towards furnishing prospective new customers with gas?

A We are continuing to furnish all new customers or all new applicants along our lines with gas.

Q So that although the supply to the Ammonia Plant may be interrupted, you still continue to supply new customers if they ask for your service, is that correct?

A That is correct. The amount of curtailment, Mr. Frere, next winter, I would not anticipate would be of any great consequence. There is a very good chance that with favourable weather we might not have to curtail at all. If we do have to curtail, I think it would be a matter of hours, or, at the worst, perhaps not more than a day or two, and it would probably be only a partial curtailment to any one user. Moreover, we realize we have to get a new supply almost immediately. We are doing everything we can at the moment to get that new supply, and we feel that in view of those circumstances, there is no point in refusing service to new customers on the line.

Q But as time goes on there is an increasing possibility of the load required for the Ammonia Plant being interrupted?

A Well, as soon as we get a new supply that possibly will disappear.

Q Have you made any specific plans for additional supplies?

A We are continually trying to negotiate a new supply.

Q But you cannot say that you will have that new supply within a year or two years?







F. A. Brownie,  
Cr. Ex. by Mr. Frere  
Cr. Ex. by Mr. C.E. Smith

- 1445 -

A I cannot perhaps say that specifically, but I do not know what is going to stop us. Gas reserves are available, and we have the money to connect them up.

Q I think that is all.

.....

CROSS-EXAMINATION BY MR. C. E. SMITH:

Q Mr. Brownie, I won't have to ask you now about dumping in Exhibit 96 in any event. Having regard to what Mr. Fenerty opened with in connection with Mr. Ralph Davis, you indicated to him in addition to the estimates referred to in your 96 that you have estimates with respect to one or two other fields, if I might use that word. Are all of those estimates, can they be made available to this Board, Mr. Brownie?

A I believe they can, Mr. Smith. I would like to think whether there is any restriction on any of them, but I think they would be made available.

Q Maybe you would like to consult with Mr. Steer before you do that?

A Yes.

Q Subject to such things as that, are they available here?

A Yes.

Q So they can be tendered to the Board at some future time?

A Yes.

Q By the way, when was the estimate made with respect to Jumping Pound, was that '48 or when?

A No, that was made.....

Q More recently?

A Early this year.





F. A. Brownie,  
Cr. Ex. by Mr. C.E. Smith

- 1446 -

Q And the other ones, the South fields?

A The fields south of Foremost....

Q Approximately will be?

A Well, within the last two years.

Q Within the last two years?

A Yes.

Q Will you look into my first question and see if they can be made available?

A Yes, I will.

Q To this Board?

A Yes.

Q Now, having regard to Exhibit 42, Mr. Brownie, have you got it before you there?

A Yes.

Q And to Schedule "C" thereof. If I understand this correctly, your total of 78,400 at the very bottom of the page, where you say "say 78", what is that, billions, I guess?

A 78 billion cubic feet.

Q Yes. I take it that assuming Statement "C" to be your best estimate, and arriving at the total of 78 billion, that for the 50-year period, and using the system of multiplying by the number of years, that the number of years as indicated in Statement "C" would give us about 4 trillion cubic feet of gas, is that right?

A That is correct.

Q Using the same system as we have used previously?

A Yes.

Q In this Exhibit 42?

A Yes.

Q Now, just one other question, I think. Oh, no, in your 96,





F. A. Brownie,  
Cr. Ex. by Mr. C.E.Smith.

- 1447 -

if I understand you correctly, in the very last paragraph, where you say, the very last sentence, "Such reserves will be exhausted in about 20 years." Now, the "about 20 years" is from roughly at this time, from about 1950, is it?

A Yes, or from the date when they are connected.

Q Or from the date when they are connected?

A Yes.

Q In any event, it is not 20 years after 1960?

A No.

Q And still with respect to the same paragraph, and at the bottom of page 3, you say this, Mr. Brownie, that, "Below is a statement, based on certain assumptions, which shows the estimated annual take from the Jumping Pound field." You may have dealt briefly with the expression "based on certain assumptions" yesterday, but is there any further extension of that explanation you can give us this morning? In other words, what about it, if you can tell me?

A We assumed a certain well drilling program in Jumping Pound, we assumed an average deliverability of those wells, which I think we took to be 8 million cubic feet per day, we had certain information as to the deliverability of Turner Valley, and we measured the Canadian Western market between the two fields in proportion to the respective deliverabilities.

Q Having regard to what you have just said, is it your opinion that such an arrangement, if made, would allow Jumping Pound to be operated by the Shell people and be operated economically, I suppose?

A Well, that would depend on the price.

Q Well, maybe a lot of things do, but I just want to find out whether in your opinion it could be done on the assumption





F. A. Brownie,  
Cr. Ex. by Mr. C.E. Smith

- 1448 -

that you have now in mind?

A I believe it could.

Q And I am taking it that we all assume that to operate that field that it cannot be operated just to hit peak loads every now and again, it has to be a continuous operation, hasn't it, in your idea, Mr. Brownie?

A Yes.

Q And you think that could be worked out?

A I think it could.

Q Assuming that?

A Yes.

Q I take it from what you have said, it is fair to ask you if you are already negotiating to that effect, is that correct?

A That is correct.

Q And that is what you meant yesterday when you referred to Royalite and Shell, that you were now negotiating. I take it Royalite is interested because of the hook-up with regard to Turner Valley, is that right?

A I do not recall having said that, Mr. Smith.

Q I thought you said that yesterday. Others have the same idea. You mentioned Royalite in regard to it. I have not seen the transcript.

A I do not believe I said that, Mr. Smith.

Q It is apparently just an arrangement between you and Shell, that you are talking about, is that right?

A I wouldn't say that either.

Q Will you say something now and clear it up in my mind, in any event?

A I would prefer not to, unless you insist. We are in the





F. A. Brownie,  
Cr. Ex. by Mr. C. E. Smith

- 1449 -

midst of certain negotiations and I prefer not to go into the thing any further than I have unless it is of particular interest to the Board.

Q I am not going to suggest that I am going to ask the Board to direct you to answer unless you feel you should?

A I would prefer not to.

Q It may be that in some future evidence I will be in a position to ask you again?

A I hope so very soon.

(Go to Page 1450)





T-1-1

F. A. Brownie,  
Cross-Exam. by Mr. Smith.  
" " " Mr. Frere.

- 1450 -

Q Just one other question. I notice in the Table at the bottom of page 3 of Exhibit 96 an amount of 19.5 and do you anticipate any difficulty with respect to the ability to produce it there on that basis?

A Mr. Smith, I really could not answer that question. There is so little information about that field that I think the matter has to be explored considerably more before I would be in a position to answer that question.

Q You will have your own experts who will be at some time sitting around this table and whom we may have the benefit of cross-examining?

A That is correct.

Q But you have not done so yet?

A Yes, we have.

Q Would they be available to us, would that knowledge be made available to us from those people?

A I think so.

Q Presently?

A Not presently, because the information has not been supplied to us and I feel that there must be more information available than we have received.

CROSS-EXAMINATION BY MR. FRERE:

MR. FRERE: You may not wish to answer this question, Mr. Brownie, as it involves Shell. It is my understanding that the Jumping Pound field is controlled by a wholly-owned subsidiary of the Shell Oil Company?

A Yes.

Q And it is my information that the Shell have committed the Jumping Pound gas for export only?

A I believe that is correct.

Q Does that affect your plans for additional supplies?





T-1-2

F. A. Brownie,  
Cross-Exam. by Mr. Frere,  
" " by Mr. Steer.

- 1451 -

A It has in the past.

Q And are you prepared to say whether it would or not in the future?

A No.

CROSS-EXAMINATION BY MR. STEER:

Q MR. STEER: Mr. Brownie, have you prepared some additional figures with respect to that Statement "C" in Exhibit 42 for the purpose of breaking down as far as possible the items on that Statement "C" referring to additional possibilities?

A Yes, at the request of the Board we made a breakdown, a complete breakdown of Commercial, Domestic and Industrial for the year 1960. Estimated. I do not know how good it is, but we did the best job we could.

Q You are prepared to file that?

A Yes.

DOCUMENT IN QUESTION IS  
NOW MARKED EXHIBIT 97.

Q That is self-explanatory?

A Yes, I think so.

MR. STEER:

That could be put in the record?

THE CHAIRMAN:

Yes.

MR. NOLAN:

Because copies are not available

to us.

THE CHAIRMAN:

Right.

: : : : :



T-1-3

F. A. Brownie,  
Cross-exam. by Mr. Steer.

- 1452 -

(Exhibit 97)

CANADIAN WESTERN NATURAL GAS COMPANY LIMITED  
and  
NORTHWESTERN UTILITIES, LIMITED

Re Statement "C" - Exhibit 42, Westcoast Hearing

Complete Breakdown to Domestic, Commercial & Industrial -1960

MCF				
<u>Canadian Western</u>	<u>Domestic</u>	<u>Commercial</u>	<u>Industrial</u>	<u>Total</u>
Basic Loads	9,500,000	5,400,000	3,600,000	18,500,000
Imperial Oil, Alberta	-	-	6,300,000	6,300,000
Nitrogen & Taber Sugar				
Additional Power Plant	-	-	2,200,000	2,200,000
Loads				
Additional Possibilities	400,000	600,000	3,500,000	4,500,000
TOTAL CANADIAN WESTERN	<u>9,900,000</u>	<u>6,000,000</u>	<u>15,600,000</u>	<u>31,500,000</u>
<u>Northwestern</u>				
Basic Loads	13,200,000	9,100,000	2,400,000	24,700,000
Imperial Oil & City				
Power	-	-	4,500,000	4,500,000
Fort Saskatchewan,	40,000	890,000	70,000	1,000,000
Oliver & Namao				
Additional Possibilities	-	200,000	3,500,000	3,700,000
TOTAL NORTHWESTERN	<u>13,240,000</u>	<u>10,190,000</u>	<u>10,470,000</u>	<u>33,900,000</u>
say	<u>13,200,000</u>	<u>10,200,000</u>	<u>10,500,000</u>	<u>33,900,000</u>
<u>Remainder of Province</u>				
Presently served	<u>1,700,000</u>	<u>1,100,000</u>	<u>4,200,000</u>	<u>7,000,000</u>
communities				
<u>Province Generally</u>				
Towns not presently				
served	600,000	400,000	-	1,000,000
Pulp & Paper Plant	-	-	2,000,000	2,000,000
Other Industrial Enterprises	-	-	3,000,000	3,000,000
TOTALS	<u>600,000</u>	<u>400,000</u>	<u>5,000,000</u>	<u>6,000,000</u>
GRAND TOTALS	<u>25,400,000</u>	<u>17,700,000</u>	<u>35,300,000</u>	<u>78,400,000</u>
say	<u>25,000,000</u>	<u>18,000,000</u>	<u>35,000,000</u>	<u>78,000,000</u>

BWS:JDW (6)  
Apr.12/50





F. A. Brownie, - 1453 -  
Exam. by Dr. Govier.  
Dr. Nauss - Recalled. Cr.Ex. by Mr. Smith.

EXAMINED BY DR. GOVIER:

Q DR. GOVIER: Have your companies made any studies of the long-term population trends in the Province or the two major cities?

A Just what we indicated in Exhibit 41. We have some curves that may be of interest that can be referred to.

Q I understand your reluctance to predict beyond 1960 but if you have made any further studies - -

A I do not believe we have. I do not recall anything we have done along that line, Dr. Govier.

THE CHAIRMAN: Thanks. Could Dr. Nauss be brought back, Mr. McDonald?

MR. McDONALD: Yes. Pardon me, he has just left the room. He will be here in a moment.

DR. NAUSS (Recalled)

MR. McDONALD: Have you any further questions of Dr. Nauss, Mr. Fenerty?

MR. FENERTY: No.

THE CHAIRMAN: Do any counsel wish to examine Dr. Nauss?

MR. SMITH: I have something if nobody else has.

CROSS-EXAMINED BY MR. SMITH:

Q Doctor, I will try and not repeat anything I said to you before but with respect to the question of reserves, I take it this is true that they might be put in three categories. One, those that are within easy reach of a central pipeline, that is, economic reach of a central pipeline. Two, those that are within economic reach of an extensive grid system and three, those that are beyond reach of either. Is that a fair way to describe it?

A Yes, I think you could say that. Although I would like to





Dr. A. W. Nauss,  
Cross-exam. by Mr. Smith.

- 1454 -

enlarge on it. In blocking reserves now inaccessible or beyond reach of any pipeline, it could, by development of a larger reserve in that zone or in that pool, it could become available or within economic reach of all of them.

Q In other words, probably a good illustration of that would be one of your one-well fields, which probably in itself is beyond economic reach presently without developing or digging a lot more wells?

A That is correct.

Q And with respect to all these things, I take it Table "A" of Exhibit 3 as amended includes some of all these categories we have just mentioned?

A That is so, yes, sir.

Q It includes a fair number of what I might call those one-well fields?

A Yes. Now when you said "one-well fields" - -

Q Maybe I should not say "fields".

A They are not one-well fields. I prefer to look at those as discovery wells.

Q All right, we will not quibble on a question of language.

A It may be a 1000-well field. We do not know at the present time.

Q But they are presently what we might describe as fields with only one well in them?

A That is right.

Q Now I think this is not an exhibit in itself. It is a document that starts with Exhibit 78. With regard to Table "A" headed, "Factors in Recovery Percentage." I cannot give you the page number because it is not numbered. Probably you are, however, familiar with it and can find it.



Dr. A. W. Nauss,  
Cross-exam. by Mr. Smith.

- 1455 -

I think that was prepared by you because of a suggestion made by the Board at the previous hearing?

A Yes, sir.

Q Firstly and generally I suggest this to you, that the factors you set out there are not by any means inclusive of all the factors that might be found in the same or other of the various fields you have previously mentioned.

A There are possibilities of certain other factors but I think these are the important ones.

Q There are others which you, as a geologist, would think were much more important, wouldn't you?

A I think you will notice that these notes are worded in fairly general terms and are intended to be inclusive.

Q Well, will you take c. and d. What about those?

A Yes.

Q Take c.?

A Premature abandonment of wells due to mechanical failure.

Q Yes, and take d.?

A Waste due to open flow tests and flaring of gas.

Q And e. for example?

A Well-head and lease fuel. Lease fuel would include any fuel.

Q Used in any way in the operation?

A That is right.

Q I will agree then that that is very general but do you suggest 1% is sufficient to include all the factors you might have in your mind?

A In a dry gas pool it is, because you would use a great deal less fuel.

Q They seem to vary from 1% to 15%?

A In Turner Valley it is higher than 1%.





Q And in some other pools, speaking generally?

A At Pincher Creek and Jumping Pound I think it would be higher than 1%.

Q There would not be much doubt about that?

A No.

Q You have used some general terms including a great number of factors which, to a layman at least, might not be included in your general terms. Is that a fair way to put it? For instance c.? You include a great number of things in that?

A That is correct.

Q You include everything in that one item. You have taken them all into consideration. And then you come to e. Well-head and lease fuel - 1%.

A That is correct. It does not include such things as supplying Leduc. I do not mean the Town of Leduc, I mean the town of Devon. That would be separate.

Q Would you like to illustrate anything that it does not include?

A Yes, sir, any fuel that is not connected with the production and gathering of gas. I did not have that in mind and we did not include it.

Q You did intend to include everything connected with the production and gathering of gas, is that correct?

A That is correct.

Q Everything?

A Everything.

Q Now let us get to the bottom of the page where you mention as an example Morinville. Did I get you right when I think you said yesterday you claim no great amount of accuracy for any of these items?

A That is correct. It is difficult to predict individual conditions.





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Q I am not being critical but I did get you right?

A Yes.

Q And when you say you claim no great amount of accuracy for any of the items, I suppose nobody else could with what information you have now?

A That is correct.

Q I notice Morinville comes out with a nice round figure of 10%. Did you start with a figure of 10% and then did you divide it and make it 10 or did you figure each item?

A No, I started with the 10%. You asked me for this. I did not intend to put this in when I started but you asked for these things, the different factors that would make up that 10%. I started in every case with the 10% and I made it add up to 10%.

Q You just made it add up to the 10%?

A That is correct. Exactly.

Q And if I asked you to do the same thing with respect to the various fields that are detailed in the submission we got yesterday but not marked, prepared by Dr. Hetherington - -

A Yes.

Q And if I asked you to do the same thing with respect to Foremost or with the Redwarer or Leduc or Viking-Kinsella and so on, we would only get the same thing as you did in Morinville?

A It could be done but I believe it would be a waste of time.

Q It might not be a waste of time. It might be something this Board should consider rather seriously, the question of percentages. If it can easily be done, will you do it with respect to the fields set out in what I assume will be an exhibit in a few minutes?



A Yes. If you wish that information I will be glad to supply it.

Q And if you can do it with respect to any of these fields with more accuracy than you have stated you used with respect to the Morinville pool, will you keep that in mind too?

A If I can do it with more accuracy, I will certainly do it.

Q It may be there are some fields where you can be more accurate?

A Yes, for instance in Turner Valley where we have had experience.

Q You can eliminate Turner Valley for my purposes.

A All right.

Q And will you try and do that and not start with your total and work it backwards? Or am I asking you to do too much?

A Well I can do that.

Q All right, where you can will you do that?

A Yes, I will do that.

Q There may be some fields where you can use pretty accurate percentages?

A The point is that those average figures - -

Q What do you mean by those average figures, 1 to 15% and you will take the middle?

A You are requesting that I forget about the figures I used here and make out a new set on a different basis.





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Q What do you mean here, in Table A?

A And make up a new set on a different basis to see how they might check, is that it?

Q Well, if you can give us a new set on a different basis we will be glad to compare both of them, but I am suggesting that you might with respect to the fields from which, as I understand, both you and the Province of Alberta intend to take gas for some time as set out in this new schedule, Schedule for Gas Production for Provincial and Export Gas Lines, with respect to those fields, and you could use a similar example that you gave us with respect to Morinville, with all the accuracy with respect to it that you can.

A Yes, I can do that.

Q Not bothering with Turner Valley.

A I can supply that data with more accuracy if you did not require it at this present Sitting.

Q Well, I will take the responsibility insofar as I am concerned of not requiring it. It may take you some time, and if you need time you should have it, Doctor, by all means. At some future time it will be made available to this Board?

A That is correct.

Q Now, one other thing I want to ask you, Doctor. In this same document which starts with Exhibit 78 -- oh, by the way, with respect to Exhibit 78 I think Mr. Fenerty asked you -- that is a letter from Imperial Oil, 78 -- I am not sure whether he referred you to the last paragraph on page 2 of that letter, and it is page 2 of this





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book form document?

A Yes.

Q Where they state, "We believe it is worthwhile to restate the view expressed before the Dinning Commission that estimates by reservoir engineers early in the life of any major oil field are subject to continual revision." I do not know whether Mr. Fenerty referred you to that sentence or not.

A Yes.

Q And I think you said you were in agreement?

A Yes.

Q Then I think you tried to draw some distinction between the question of oil and gas and you said that certain things had nothing to do with the question of gas, do you remember that?

A Well, in this letter they are referring particularly not to reserve calculations. I believe they are fairly satisfied with those at the present time. They were referring more to the gas-oil ratio.

Q To whatever they are referrring, what was the distinction you drew yesterday if we use the word gas instead of oil?

A That is what I am coming to, that in this case they are referring to the gas-oil ratio. Depending on the pressure condition in the reservoir as they withdraw oil the gas-oil ratio will either go up or stay the same. For example, if the oil-water interface advances and if there is a 100% water drive, then the gas-oil ratio will not go up as much as if there is an expanding gas drive, and they have assumed a certain reservoir mechanism



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here in order to arrive at a gas-oil ratio and then multiplying the gas-oil ratio by the amount of oil they think they will produce, they arrive at a production rate for gas, so that you see the reservoir mechanism has an important bearing on the amount of gas that can be produced. In the case of a dry gas pool, the problem is different, the problem of calculating the amount of gas that can be produced each day is simpler.

Q Let me put this to you, without referring to the letter then, is it true in your opinion, Doctor, that estimates with respect to the life of any major gas field are subject to continuous revision?

A They most certainly are.

Q Okay. Then I have wasted time in referring to that. Then again, Doctor, I want to refer you to this thing that starts with Exhibit 78, referring to about four or five pages along, the heading: "Sources of Gas Included in Table A of Exhibit 3". Do you remember that? This, I think, was prepared at my request or the Board's or somebody's request to show where you got your information when you compiled Table A of Exhibit 3.

A Yes, sir.

Q And you have an index at the bottom of this statement "Sources of Data Included" and it is for simplification, you look for a certain number, look at the number and then refer to your sort of index at the back. Do you notice?

A Yes.

Q I want you to refer to No. 11.





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A Yes.

Q Which reads, "From Report by R.E. Davis to Eastman, Dillon & Company entitled 'Report of Natural Gas Reserves in the Northerly Part of Alberta Province, Canada'." Can you submit that report to the Board, Dr. Nauss?

A I am willing to. I will have to refer you to Counsel.

MR. McDONALD: I believe it is available, Mr. Chairman. It is the property of Eastman, Dillon Company and we will have to contact them.

MR. C.E. SMITH: It is something you have already used, as Dr. Nauss said.

MR. McDONALD: Well, used it for that particular point, yes.

MR. SMITH: Well, we would like to see it.

Q By the way, do you know Ralph E. Davis?

A THE WITNESS: Yes, I do, sir.

Q You know him to be a fairly well known and highly respected man in his profession?

A Yes.

Q Not as a man, necessarily, but as a professional man, that is correct?

A Yes, that is correct.

Q He is fairly well known in this country, and probably all of the United States?

A Yes.

Q Well, after consultation with your Counsel if necessary, will you let us have that report, or will your Counsel let me know why not? Is that fair?

A Yes, sir.





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MR. McDONALD: It is the property of Eastman,  
Dillon & Company, that is all.

MR. C.E. SMITH: It sounds to me it might be  
quite an informative document for this Board.

MR. McDONALD: It may be.

MR. SMITH: Thanks.

EXAMINATION by DR. GOVIER.

Q Dr. Nauss, I have a few questions in connection with  
Exhibits 80 and 81. Perhaps we could look at Exhibit  
80 first. Am I right, Dr. Nauss, that the data shown on  
this exhibit form the basis of subsequent calculations  
made by Dr. Hetherington in connection with deliverability?

A Yes, sir.

Q And is there any supplementary back pressure data avail-  
able to Dr. Hetherington, or is this all of it?

A On the Pincher Creek field, you mean?

Q Yes?

A No, this is all of the back pressure data on the Pincher  
Creek field that we had available to us.

Q I assume then, Dr. Nauss, that the reliability and  
accuracy of the data shown in Exhibit 80 is very important  
because it is going to form the basis for the deliver-  
ability charts on this field, is that correct?

A At the present time, yes, sir.

Q I notice that there are points plotted at the top of  
each of the lines that appear in Exhibit 80. Am I  
right in assuming that those points do not represent  
any experimental tests but really the end of a line



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that has been extrapolated to that height?

A They are not the result of an experimental test, no.

Q So that we should disregard those points insofar as determining whether there is enough data to justify the location of the line?

A Yes, I think so.

Q With respect to line 1, Dr. Nauss, does it appear to you that the slope of that line is rather unusual for a test of this sort?

A I had not checked that. I might refer you to Dr. Hetherington for an answer to that.

Q Has Dr. Hetherington considered the reliability and accuracy of this data?

A He has considered the data on the chart, yes.

Q Would you agree that line No. 1 is located by the position of 5 points that are plotted, one off the bottom of the line and two a quarter of the way up the line, and two about half way up the line?

A That is right, yes.

Q And that the top point really does not represent any data which helped to establish the line?

A No, I do not think the top point in any of these cases was a measurement. That is the open flow. Extrapolated the line to open flow, in other words, to the point where -- to the value of the squared formation pressure.

Q In other words, in all of the data shown in this chart the maximum flow rate at the well was actually somewhere around 15 million cubic feet per day represented by a point near line 1?





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A The maximum measured flow on all of the tests was 15 million on these charts, yes.

Q Now, I understand, Dr. Nauss, that when these tests were conducted in the field the gas flow was measured by passing the discharge from the well through a separator and then through a meter. Is that your understanding?

A No, I was not familiar with that.

Q I believe that is the situation. We might consider that the measure is reasonably reliable. My understanding is, as far as determining the sand face pressure, which is one of the points in the p.s. square term, that the quantity be determined by calculation of a measured top hole pressure ?

A Well, on this curve No. 4, during that test they did have a bottom hole gauge, pressure gauge, during the test period, and during the test it seemed to work so that I think the bottom point there -- the reason they consider it reliable was because that bottom hole pressure chart was working for that value, but for all the other values it did not work. In regard to the others I think it was a top hole measured pressure, yes.

Q And from the top hole measured pressure a calculation was made to determine the effect of hydrostatic head and flow friction and the calculated sand pressure?

A Yes.

Q Do you have any idea, Dr. Nauss, of the magnitude of those two corrections, of the hydrostatic head correction and the friction correction?

A In the case of Pincher Creek it is very substantial





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because they were using -- these flows were through tubing and the frictional flow correction is very substantial.

Q Would you suggest that the two corrections together might amount to 1500 pounds or more?

A Yes, they could easily amount to that much. I would like to have them recalculated to see how much they would amount to.

Q Suppose for the time being, Dr. Nauss, we assume they are significant and perhaps on the order of 1500 pounds in total, those two corrections.

A Yes.

Q I believe that this well, while under test, discharged somewhere from 3 to 5 hundred barrels per day of condensate, is that correct?

A Yes, there was a considerable amount of condensate.

Q Would you not agree, then, that because of the presence of condensate in the flow stream it is extremely difficult to calculate the hydrostatic head effect and the flowing friction effect with real accuracy?

A That is right. And in addition, liquid loading, as a matter of fact, if that is what you are thinking about, is one of the most important factors in a back pressure test, and it is one of the things that has -- the effect of the loading is very difficult to calculate.

Q I was not thinking entirely of liquid loading, as a matter of fact. I agree that is a possibility. I was thinking primarily of the fact that the presence of condensate in the flow stream would have the effect of



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increasing the friction, or in this case, making the friction extremely difficult to calculate.

A Yes. In addition to that, though, it decreases the flow. I think probably it decreases the flow considerably so that the amount of flow is cut down due to the presence of that liquid.

Q Well, Dr. Nauss, without going into the details of this, would you agree that because of the presence of liquid, either as liquid or in the form of a mist in the flowing fluid, it is very difficult to calculate both the hydrostatic head part of the correction and the friction part of the correction with accuracy?

A Yes, I would agree with that.

Q Would you agree that one might easily be out as much as 10% in such a calculation?

A Yes.

Q And 10% of a correction of perhaps 1500 pounds might be 100, 150 pounds, or a significant amount?

A Yes, it would be a significant amount.

Q Dr. Nauss, referring particularly to the lower point at the bottom of this chart, it seems to me that if there is an uncertainty of anywhere from say 25 to a couple of hundred pounds in the calculated sand face pressure, that the lower points of the chart in particular might be uncertain by as much as a quarter to half an inch in their position on the chart.

A There is one element of reliability in the chart, though, the fact that they do line up to a certain extent in a straight line.





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Q Yes. That may be an indication of reliability or it may be an indication of a consistent error in calculation, is that correct?

A It would have to be consistent, all right, but under these different pressure conditions that you had in the flowing stream of gas, the amount of liquid would vary considerably as the pressure varied, the amount of condensate would vary considerably as the pressure varied and it seems to me that if these figures were totally unreliable they would not line up in a straight line.

Q Oh, I am not suggesting, Dr. Nauss, they may be totally unreliable but I am trying to find out what measure of error may exist with respect to some of these points, because, as you have agreed, these data are critically important in the development of the deliverability charts, and I was suggesting that inasmuch as a substantial correction has to be calculated, a correction of the order of 1500 pounds, and inasmuch as our present knowledge of flow characteristics of a 2-phase system to a flow stream is rather limited, there may be an error of considerable magnitude in the calculated sand face pressure, and I was also suggesting that possibly that might mean that some of the points may be out an eighth of an inch, a quarter of an inch, or even a half of an inch in their position on the chart.

A Well, that is very definitely correct. There is the possibility of considerable error in the figures all right, a considerable percentage of error, and I think that is probably one of the main reasons that the curve





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for No. 4 here was considered by the Gulf Oil Company to be unreliable.

Q That is curve No. 4?

A Curve No. 4. Actually this is what happened. Notice on here on the description of curve 4, "Flow Tests on Marr No. 1 Conducted in August 1949. Open Hole Section 12,255 to 12,480 Exposed, and Acidized with 3,000 gallons prior to Test. Curve No. 4 Constructed Parallel to Curve No. 2 through point indicating producing rate of 7.3 million cubic feet per day."

Q I believe that curve 2 should be curve 3, shouldn't it?

A Curve 3, yes. "Observed well head pressure at higher rates of flow indicate infinite capacity when using U.S.B.M. Monograph 7 Method." What that means is, as the increased flow rate -- in other words, the curve was horizontal according to the figures they had.

Q Which is another indication of the uncertainty of the figures, isn't it?

A That is right. And I think, under those conditions, there must have been a considerable amount of liquid loading. Possibly those lower figures, that would be a low pressure, and there was a lot of condensate material in it and as they increased --

Q Excuse me, Dr. Nauss. Did you say that the low point would reflect a low pressure?

A No.

Q Reflect a high pressure?

A Reflect a high pressure, that is right.

Q Look again at curve No. 1, Dr. Nauss. I wonder if you



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would agree to this, that inasmuch as the 5 points which are used to define the location of that curve --

A Curve No. 1?

Q Curve No. 1. Inasmuch as those 5 points may each be in error a bit, and inasmuch also that the bottom point is susceptible to a greater percentage of error, would you not agree it might be a better representation or a better interpretation of this data to draw through the cluster of points a line of a slope such as one would ordinarily expect? I would suggest that the slope of curve 1 is rather unusual for such a line to show and that in view of the unreliability of the data it might be better to draw a line of steeper slope reflecting a lower end value.

A A flow such as that is in 2 and 3.

Q Such as that in curves 2 and 3, yes.

A Well, of course, I think that our data is based on the slope as indicated in 2 and 3. You will have to check with Dr. Hetherington on that.

Q I have looked through the submission Dr. Hetherington has to make and it appears that he assumed an open flow for Pincher Creek, an absolute open flow of somewhere in the nature of 70 million cubic feet per day. Now, while I would like to question him on this, I have assumed that he got that by somehow or other averaging the 45 million open flow indicated by curve 1 and the 83 open flow indicated by curve 4. I may be wrong there.

Q No, that was not the case. In fact, the curve 4 is the absolute open flow indicated at 83 million, and you will notice on these tests that the entire zone is not open.





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Take curve No. 1 for example, the open section was from 11755 to 11927, it was not acidized. Now, if it were acidized you would expect to increase the permeability considerably.

Q Yes?

A In addition to that, if you had a more open section you might increase the flow considerably.

Q But the fact remains that the test data, and the only test data available --

A Are these.

Q Are these data?

A Yes, but I think we have to consider that they did not acidize and that the formation is quite impermeable in general. It has to be acidized to get the maximum flow rate.

Q The point seems to be this, Dr. Nauss, that you have test data before acidization and you say without the complete section exposed. I imagine that what you do in interpreting the data is to see what that would indicate in the way of an open flow and then increase it or adjust it to compensate for the fact that it was not acidized, that the entire section may not have been open.

A Yes. There is no mathematical method you could use. As a matter of fact, if you use the mathematical method on that you would arrive at a larger open flow than we used. If you increased the open flows in the proportion that these open flows were increased by acidization here, I think you would come to a rather large open flow. Let



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us look at this graph No. 3 as the open flow test on Marr No. 1, on the open section 12,255 to 12,768. The section was not acidized and the open flow obtained was 14 million, you see. When they acidized it, the interval was smaller, from 12,255, which you notice is the same as the top in curve No. 3, to 12,480. There was some pore section below 12,480 so their interval was smaller, and when they acidized that well the open flow -- of course, we have not got a reliable open flow here, but using the same slope, the conservative slope, the data indicates you have increased the open flow from 14 million to 83 million. Well, if you use that, suppose you did as you suggested, which I agree with, incidentally, I think you could take the conservative slope through that cluster of points considering that the slope would be more reliable than the points as plotted here. I think that that is quite correct. Well, you would get an open flow here doing that of 25 million, the way I have drawn it here. Well then, if you multiply that with 83 over 14 you would have an open flow above 100 million.

Q I certainly agree with your arithmetic, Dr. Nauss, but I would like also to question you on the reliability of the point and the only point we have on curve 4, and I would like to suggest to you that that might easily be out as much as an inch vertically, depending on the reliability of the friction and hydrostatic head calculations.

A All right. Let us assume it is out an inch vertically and we will raise it one inch, say to the 2 million





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squared formation pressure. I think that is millions, isn't it?

Q Yes.

A On the line 2 there. And then draw that slope up parallel to the conservative slope and you would arrive at an open flow here of 55 million approximately, or say 50 million.

Q I get closer to 40, 35.

Q You get closer to 40? All right, let us use 40, and then take that ratio 14 to 40, let us say 4 times. Well then, multiply your 25 by 4 and you still arrive at 100 million.

Q Yes, I agree with that arithmetic.

A So that if we take 70 million I do not think that is too unreasonable.

Q Dr. Nauss, do you know whether the Gulf Oil Company are completely satisfied with these back pressure data?

A I know they are not.

Q But they feel that these data are at least sufficient to substantiate a claim for an average open flow of about 70 million cubic feet per day?

A Well, let us put it this way, I think that they are sufficient to establish a claim for a productive rate per well of say 15 to 17 million cubic feet per day, something like that.

Q Do you know whether Gulf feel that way about them, or the Gulf engineers who are concerned with the collection of this data?

A I talked that over with them, and I believe they were talking in terms of 10 million and 12 million cubic



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feet per day.

Q As the operating rate?

A Yes, as the maximum operating load.

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Q As the operating rate?

A As the operating rate.

Q Producing?

A Yes. That is the maximum operating rate.

Q With respect to Exhibit 81, Dr. Nauss, are these the data on which Dr. Netherington bases his deliverability calculation of the Jumping Pound field?

A Yes.

Q Are there any other data available for those calculations? That is, back pressure data.

A We have no other back pressure data, no, sir.

Q Do you consider these back pressure tests reasonably reliable?

A Well there are the same difficulties in connection with those that you have in connection with the other. You will also notice that they do line up in a straight line again.

Q Do you know whether the sand face pressure was calculated or a measured one in the case of these tests?

A I think it was calculated.

Q So there might be some degree of uncertainty?

A Yes, there might be some degree of uncertainty.

Q Would you agree, Dr. Nauss - -

A Except there was less liquid in this case. There was some liquid being produced with the gas. I do not remember the exact figures now. There was some oil being produced with the gas during the time that these wells were producing. I think that there were 6,000 barrels of fluid produced from one of the wells during the period of production.

Q In any case, because of the presence of some liquid at any rate it is extremely difficult to calculate both the hydrostatic head and the frictional flow with accuracy?



- A Yes, that is correct. But offsetting that you have a lower flow rate as a result of the presence of fluid. The flow rate is brought down very markedly by the presence of fluid in these tests.
- Q Of course the flow rate and pressure data are both reflected in the position of the point?
- A Yes.
- Q As far as the calculation of the sand face pressure is concerned if there is uncertainty as I suggest exists in that calculation, you would agree that the percentage from your  $P_f^2 - P_s^2$  would be higher for the lower points than it would be for the higher points?
- A Yes, the percentage of error is higher. That is assuming that the purpose of your chart is to calculate the open flow.
- Q Yes, and that is the purpose of these charts?
- A Yes. Well, it is the purpose of these charts here in general but the main purpose of a back pressure test is to determine the optimum flow rate. The optimum operating flow rate.
- Q My understanding is a back pressure test was to indicate the flowing characteristics of a well at various pressures?
- A Yes, that is right. But that is not the point. You take the back pressure test at low pressures - I mean at high pressures, I am sorry - and get the back pressure. But I do not think you should extrapolate that curve and point spacing and then stop and calculate how you should produce.
- Q Is not that what you intend to do?
- A That is what we are doing here merely because the law states you can produce a well to a maximum of 25% of its open flow. I think the better engineering policy would be, since these figures are all around the pressures you are operating on





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anyway, it would be better to take your operating pressure right off the chart directly because your measured points are not your operating pressures you are going to use. In other words there is no necessity of extrapolating them to open flow.

Q I do not imagine that but you said Dr. Hetherington's purpose in trying to show us the deliverability characteristics of a well, and if it is a Leduc well its reservoir pressure is declining?

A I think it would be better than bringing the open flow into it. I think that you would have a more accurate picture. You still establish the slope of the line.

Q Dr. Nauss, I think we might - -

A More accurate, in that the place you are using them, that is the point I am making. I think it might be inaccurate to use this extrapolated course. You are not using it in any of that extrapolated course. You are using it from those points downward where it is reliable.

Q In any event I take it you are in general agreement that there is uncertainty in this data which might tend to throw the slope of the line one way or the other, if the uncertainty were actual?

A Yes, that is true.

Q Do you know whether the Shell Oil people are completely satisfied with these back pressure tests on the Jumping Pound wells?

A I cannot say in connection with - - I would not know. I have not talked to the Shell themselves about the back pressure test. I did talk to Dr. Dodge who worked for them. We discussed them for a short period of time but he did not



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state any unreliability or any dissatisfaction with them.

Q Did he indicate any dissatisfaction with the data shown on Exhibit 80?

A Exhibit 80?

Q Pincher Creek?

A No, he did not. He was not familiar with all the facts in that case.

Q Thank you, Doctor.

EXAMINED BY MR. GOODALL:

Q Concerning these isopach maps, I am a little uncertain about that, whether it was prepared before you made your submission in Exhibit 3. Was that requested by counsel? That is Exhibit 86.

A Yes, 86, you asked for the basis for my thickness measurement. How I arrived at the average thickness for the Morinville pool.

Q The reason I ask this, it is a smaller area than is shown in the Morinville - -

A That is correct. This was the original area at the time we made the calculation.

Q The original area at the time you made the calculation and before you added the Cardiff Giant well?

A Yes. We added the Cardiff Giant well. The thickness in the Cardiff Giant well was 40 feet and we assumed from the Cardiff Giant that the area added would have the same average thickness.

Q In drawing up a new map you would extend those isopachs?

A Yes, that is correct.

Q South?

A That is a copy. I drew the map up on a work sheet.





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Q Yes?

A And had that work sheet and did all the planimentering on the work sheet and constructed that isopach map and I had it copied. It now has to be revised as a result of the Cardiff Giant well.

Q In this other map you have the Redwater-Viking gas pool, Exhibit 30 in your submission. It was not marked in this hearing as Exhibit 30?

A Yes.

Q You have a number of wells shown within the area of the Viking gas pool, are these the only wells that tested for gas?

A These were the only wells that had gas tests at the time I made up this map. As I pointed out the other day, there are additional wells now to be added.

Q Yes, additional wells within this area?

A I think there are some additional wells within the area and other wells outside.

Q Did you use electrologs?

A No, just gas tests.

Q Is there not some well within that area that found the sand water saturated?

A I am not familiar with any.

Q And there are some that found the sand very tight, very small flows?

A There was not any at the time of the completion of this map. I have not looked into it since.

Q Would you say that all those who tested in this area had a substantial gas flow?

A In some cases the gas flow was not large.

Q Over a million feet a day open flow on a test?



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A I cannot recall that right now. I do not have my data with me.

Q The operators in the field are rather anxious to develop some gas for a gas lift. I believe you will agree with me that they have not so far found that or developed sufficient gas for that purpose?

A No, it would take a considerable amount of gas and you would want it under high pressure if you could.

Q By the way, what is the pressure of that Viking, do you know?

A Yes, the pressure I used here was 668 as the reservoir pressure. I was planning to do some more studying because there have been additional wells tested in the Viking, for Redwater, and that will be submitted, the revised estimate for the Redwater-Viking will be submitted.

Q I presume you followed the same pattern in the Leduc field?

A No, we followed a different pattern in the Leduc field. We used electric logs extensively in addition to the tests.

Q Then the wells shown within the area of the Leduc field might include some electrolog interpretations and are not all the result of drill stem tests?

A Yes, that is right. It includes quite a number of electric log interpretations which, under the circumstances, are quite reliable.

Q I do not seem to be able to find that map?

A It is in the other report. The second last map.

Q In these areas outlined in the Leduc field, does the map show the presence of a gas sand on the electrolog or drill stem tests?

A Three different gas sands.

Q Yes. I presume then that you are not certain what the





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potential flows of this sand - -

A No, we are not certain.

Q Or whether there is water present in any case or not?

A Yes, the drill stem test data shows where there has been water indicated. But the drill stem tests, that has been taken into consideration. There are a number of those drill stem tests have been completely water free. As an example, this area A-1 has four wells in it that were drill stem tested. The larger area which is A-2 has had nine wells in it that were drill stem tested, in that sand, that is. In area A-3 there is one well which was drill stem tested in it. Area A-4 had one well which was drill steam tested. Area sand "C" has two wells that were drill stem tested, one within the area and one outside the area. If you will refer to this, I will show you our technique which we used. I would like you to refer to Profile A-B where you will note Leduc 171 was drill stem tested.

MR. McDONALD:

That is on the last sheet, Mr. Goodall.

A It is behind that. Profile A-B you will notice that the Leduc 171 was drill stem tested and showed the presence of gas without water. In fact, it is not resting on water, it is resting on oil. That is my interpretation. A very small amount of oil in the bottom of the sand. If you look to the next two wells to the left, 175 and Imperial Leduc 15, I think you will agree with me the electric log shows the presence of the sand. By that I mean that shows the sand is there. In addition it shows that the sand is higher in Leduc 175 and Imperial Leduc 15. But if the sand is there and if it is higher and the electrolog shows there is a continuity between the wells, therefore it must contain gas.



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In other words that was the manner of using it in connection with the elevation. We are not interpreting directly from the electrolog that it shows gas but we are interpreting that the sand is present, then the electric log shows that it is present at a higher elevation and is continuous with the tested sand and therefore it contains gas.

Q That is all.

THE CHAIRMAN: I think we will adjourn for five minutes.

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THE CHAIRMAN: I think we are all through with you,  
Doctor.

MR. McDONALD: There is just one question.

THE CHAIRMAN: All right.

.....

RE-EXAMINATION BY MR. McDONALD:

Q In regard to the Pincher Creek open flow chart or graph,  
as I followed the discussion between yourself and Dr.  
Govier, Dr. Nauss, the lower point is the point of highest  
pressure, it has the highest pressure?

A Yes.

Q Well, my thought in that regard is this, that at the  
highest pressure there would be the least condensate in  
the gas as it is moved?

A That is correct.

Q When the pressure goes down that is when the condensate  
comes up?

A Yes.

Q And accumulates either in the separator or in the casing,  
or in the tubing?

A Yes, that is correct. And what that means is that the  
errors, the so-called errors or corrections due to fric-  
tional flow, the error or correction due to frictional  
flow is least at low values of flow.

Q At low values of flows, which are high values of pressure?

A Yes.. that is right.

Q And similarly, as I understand the mechanics, the high  
pressure movement, a movement at the highest pressure  
has the least friction?

A It has the least friction because it has the least flow.



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There is less gas going through. It is travelling slower.

Q In other words, the friction is related to volume?

A The friction is related to volume, but actually as the pressure goes up due to pressure alone, the friction would go up.

Q Yes?

A But at the lower rates of flow here the friction drops off very considerably.

Q On the other hand, however, eliminating those two points, the matter of friction and condensate, if this had been a dry gas treatment, and this was a dry gas chart, the point of the highest pressure would be the point that would have the greatest chance of error, the greatest element of error? Just the fact that there are more pounds involved?

A The greatest chance of error, yes, that is correct.

Q Yes, that is all.

A In other words, the data is more reliable, but because of the formula, the percentage of error can be greater?

Q Yes.

Q DR. GOVIER: Just one further question along that line, Dr. Nauss. I think we should have it clarified, that although the uncertainty in calculating friction will be less when the amount of the friction is less, that is, at lower rates of flow, nonetheless the percentage error in the squared pressure drop term may well be greater because of the fact that the squared pressure drop term itself is much smaller at lower rates of flow. Do you agree with that?

A Yes, because of the formula itself, the accuracy of the measurement has to be better in this part of the line.





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Q And regardless....

A The measurements are more accurate, but because of the formula they have to be more accurate.

Q Let us put it this way: Taking all factors into account, which points on the chart of Exhibit 80 would you assign the most weight to, the low points or the high points?

A I would assign most to the low points because of the other argument that you are dealing in the pressure range that you are actually going to produce gas at.

Q Now, Dr. Nauss, is there really very much difference in the sand face pressures represented by the various points on this chart?

A The sand face pressure all along the entire length of the line varies from one end at the open flow to the formation pressure at no flow.

Q But as far as the points that are represented here are concerned, is it not true that they all correspond with sand face pressures which are fairly high?

A Yes, they correspond.

Q And at which the reservoir fluid might be expected to exhibit similar properties.

A I think there would be some variation in the quantity of fluid from one pressure to the next, from one measured pressure to the next measured pressure.

Q Yes, Doctor, certainly there would be some variation, but what I was trying to get at, I haven't done it very well, I know, is this, that the mere presence of condensate, regardless of its movement, throws an uncertainty into these measurements, and, unfortunately, it is an uncertainty



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that we cannot estimate very closely, and because of the presence of that uncertainty, the lower points, which, as you point out, must have the highest percentage of accuracy in the p.s. measurement, in order to have the same over-all accuracy, do suffer in accuracy.

A In the over-all picture you are suggesting that the lower points are actually less accurate?

Q That is my suggestion, but I would like your opinion on it.

A I was going to recalculate it myself before I could answer the question. You might ask Dr. Hetherington.

Q Perhaps I could discuss it with Dr. Hetherington.

MR. McDONALD: That is all, Dr. Nauss. I will call Dr. Hetherington.

.....

CHARLES R. HETHERINGTON, recalled,  
having been duly sworn, examined by Mr. McDonald, testified as follows:-

Q Dr. Hetherington, you are still under oath?

A Yes.

Q In these proceedings?

A Yes.

Q During the last Hearing when we were discussing the design of the pipe line, I believe you were asked to prepare a statement of the tentative spacings for the compressor stations, and you have prepared such a statement?

A Yes. Mr. Smith asked for that information.

THE CHAIRMAN: That will be Exhibit 98.

DOCUMENT SHOWING TENTATIVE SPACINGS  
FOR COMPRESSOR STATIONS MARKED  
EXHIBIT 98.





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" Westcoast Transmission Company Limited

Tentative Spacings for Compressor Stations

Mile Post

Gathering System

Pincher Creek	0
Jumping Pound Station	150
Red Deer Station	230
Edmonton	328

Main Line

Edmonton Field Station	0
Line Station No. 1	71
" " " 2	142
" " " 3	216
" " " 4	295
" " " 5	373
" " " 6	452
" " " 7	520
" " " 8	600
" " " 9	674
" " " 10	750

Terminal	1,025	"
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MR. McDONALD: Sir, before I deal with the next exhibit with regard to the deliverability, I would like to make a statement on this matter since it is possibly one of the more important items in the consideration of the major problem that is before the Board.

In Exhibit 31 the applicant submitted to the Board a schedule of deliverability of gas from the fields from which the applicants propose to take gas. The schedule was prepared on the basis of the requirements of the pipe line company only, for the reason that at the time the schedule was prepared information was not available as to the requirements of the Alberta gas systems, particularly in respect to maximum daily requirements. This



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information was supplied by the Canadian Western Company during the cross-examination of Dr. Hetherington.

Now, Exhibit 31 was prepared to show a schedule of deliverability for a period of 20 years. This period was adopted because it is not practical to attempt to estimate deliverability over a longer period, and in the United States similar Commissions require 15 to 20 years as the period necessary towards granting of a certificate of convenience and necessity.

Exhibit 63 was prepared at Mr. Fenerty's request and extended the calculations in Exhibit 31 for the period of 30 years. This schedule again was based only on the requirements of the pipe line company.

During cross-examination, Mr. Fenerty suggested the addition of the requirements of the Provincial systems to that of the pipe line company. Such a calculation, while arithmetically correct, was not consistent with the policy of the Westcoast Company that priority be given to the Provincial systems, which was unequivocally set out in its application to the Board.

Now, the problem is to ascertain what provisions should be made to establish and maintain this priority for the Provincial systems as and when export is permitted. The estimates of the future requirements by the Provincial systems have now been placed in evidence, both by the Gas Company and by the applicant. Now, on the basis of these submissions a revised schedule of production has been prepared and will now be submitted. Now, I might say that this revision is based on Exhibit 65 with regard to the matter of maximum daily demands as estimated





Statement by Mr. McDonald.

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up to the year 1960 by Mr. Brownie and his staff. I might say further that with regard to the Northwestern Utilities system, that I did obtain from the Gas Company, the Northwestern Utilities, an estimate of the maximum daily demand of that system as in 1960, all of which was provided for the engineers who worked on that schedule.

Now, this submission is predicated upon the following:

- (1) Providing 30 years' deliverability for the Provincial systems, leaving total available reserves for a further 20 years. This provision is in accordance with the expressed policy of the Government as to future supplies of gas for Alberta consumers.
- (2) After providing for the Alberta requirements, there is available export at the rate of 60 billion cubic feet annually, as well as deliverable gas for a period in excess of 22 years, which period the applicants feel is more than adequate for the requirements of the pipe line.

Now, I wish to emphasize that if the City of Calgary differs with the estimates placed in the evidence by Mr. Brownie, that the requirements of the City of Calgary be made known to the Board and the applicants will endeavour to assist as far as possible in providing for the same.

Now, the applicants wish to make it clear that the pipe line company's attitude, or to make clear the pipe line company's attitude in respect of several points that may be of concern to the parties present.



Statement by Mr. McDonald.

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- (1) If there should be a conflict between the demands of the Alberta systems and the demands of the export pipe line, the pipe line requirements can be deferred or eliminated in any particular year or period of years. The burden will be on the pipe line company to make up any deficiency in its supplies created by the increasing demands of the Alberta systems from other sources. You will note that in the exhibit which will be filed, such sources have been termed "new discoveries".
- (2) In the submission reference is made to storage at Viking-Kinsella Field. This field is used as a typical storage field, and any other available fields in Southern or Northern Alberta may be used, and substituted for the mathematical application of the matter of storage of the Viking-Kinsella Field.
- (3) The estimates for annual and maximum day demands for all systems are the estimates which have been presented in evidence. That is to say, those presented by Mr. Brownie insofar as the two systems are concerned, and by Mr. Sample insofar as the pipe line company is concerned. If annual or maximum day demands should exceed the amount estimated in any instance, the deficiency in the schedule thereby created will be borne by the pipe line company, and if not met by new discoveries, will result in a shortening of the period for which deliverability is available to the pipe line company.

For instance, if, as Dr. Govier men-





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tioned yesterday, the pipe line deliveries should increase by sales raising the load factor from 58% to 75%, the apparent deliverability of the pipe line company will be decreased from 22 to approximately 17 years, unless, of course, new sources are added to the deliverability, or that may be substituted or added in order to take care of the increased demand.

The reason I have made that statement, sir, is to attempt to deal with the question of the policy of the company and the intent of the submission, and, if possible, leave to Dr. Hetherington the matter of the actual engineering and mechanical operation of the proposed deliverability pattern.

There is one thing, sir, that I have not mentioned in this statement, and that is the matter of costs. I do expect by tomorrow we will be prepared to deal with that item, not fully to the satisfaction of Mr. Fenerty, but, at least, start the discussion in regard to it.

MR. FENERTY: Might I say at this time that I really appreciate the applicant's attitude now, and that I realize that an earnest effort is being made to meet some, unfortunately, I am afraid, not all, of the difficulties that confront my friend with reference to Government policy.

MR. McDONALD: I submit, sir, the schedule for gas production for Provincial and export pipe lines.

THE CHAIRMAN: Exhibit 99.

SCHEDULE FOR GAS PRODUCTION FOR  
PROVINCIAL AND EXPORT PIPE LINES  
MARKED EXHIBIT 99.



Statement by Mr. McDonald  
Dr. C.R.Hetherington  
Dir.Ex.by Mr. McDonald. - 1492 -

MR. McDONALD: I have given them all away and I am left without one for myself.

Q Dr. Hetherington, will you just briefly state the method in which you have set up this schedule for gas production, and explain each section of it?

A Let me first give a summary of this exhibit. The exhibit shows a schedule of gas production for the two Provincial pipe line systems and the Westcoast export system. The exhibit shows the quantities of gas on an average day and a peak day required for those systems, and from which field that gas would be obtained, or fields. Cumulative production for the various years is indicated. The ability of the wells to produce certain quantities daily is indicated. And the last column shows the number of wells required in each field.

The first sheets in this exhibit are for individual years. There are five sheets by one-year periods, 1953, the first year of export, 1954, 1955, 1956 and 1957, the fifth year of export. Thereafter, the matter is concerned in five-year periods for a total of 30 years from the present date.

Following this is a summary sheet showing the production during each five-year period from each of the fields, and the cumulative production since 1949 from these fields. The last two columns in this summary sheet show the cumulative production during or over a 30-year period to 1980, and the available marketable <sup>as</sup> gas/ given by Dr. Nauss in his report.

Referring to the first sheet in the year 1953, the first heading is "Field" under which the





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various fields from which Provincial and export requirements would be taken are listed. The next major heading is "Average Daily Dry Gas". The requirements for Canadian Western are shown first. Those requirements were taken from Statement "C", Exhibit 42. The second column is the average daily dry gas requirements for Northwestern Utilities Company. Those requirements were taken from Statement "C", Exhibit 42.

The next column is the average daily dry gas for the Westcoast Transmission Company. Those requirements were taken from Mr. Sample's exhibit 64.

The fourth column is the total average daily dry gas required by the three systems.

The next major heading is "Peak Day", or "Maximum Daily Dry Gas", in millions of cubic feet. The Canadian Western peak daily requirements were taken from the single sheet, Exhibit 65; the Northwestern Utilities Company peak daily requirements were taken from a letter dated March 27th, 1950, from Mr. Snyder, of the Gas Company, in answer to our request in that regard; the peak day requirements for Westcoast Transmission Company were taken from Exhibit 64.

The eighth column is the total maximum daily dry gas required for the three systems.

The next two columns are "Total Production" in billions of cubic feet. The first item under that column is "During Period". The billions of cubic feet withdrawn from each of the fields during the year 1953 are tabulated and they are accumulated in the column headed "Since 1949".



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I point out in that regard that Turner Valley will be producing gas in the time interval between the present and the first year of export, 1953, and from estimates presented by Mr. Brownie, it is indicated that Turner Valley will produce prior to 1953 79.9 billion cubic feet. This figure added to the indicated production during the 1953 year of  $24\frac{1}{2}$  billion gives a total production since 1949 of 104.4 billion cubic feet.

Similarly, on the basis of Mr. Brownie's representations, the Leduc Field will possibly be produced prior to 1953. It is estimated that the Leduc Field will produce 8.8 billion cubic feet in that period, which, added to the estimated production in 1953 of 4.4 billion, gives the total production since 1949 of 13.2 billion.

The Viking-Kinsella Field will also be produced during this period, and based on estimates of requirements for Northwestern Utilities Company, it is indicated that 67.1 billion cubic feet will be produced prior to 1953.

In the 11th column of this table the average well capacity in millions of cubic feet per day at the end of the period, open flow, raw gas, is given. These estimates of the raw gas open flow that can be obtained from the average well in each of the individual fields is given by charts in the back of the report, two charts for each field.

The first chart for each field, the first one is for Foremost, is the same type of chart I presented in my previous submission. A second chart





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has been included for each of the fields, however, shows the open flow measured in millions of cubic feet of raw gas per day, as well as the billions of dry gas withdrawn. This is a more convenient chart in that it eliminates a lot of the manoeuvres that you have to go through if you use this first chart to get the answer. The two charts are consistent with each other. In fact, the second chart was calculated from the first chart.

The 12th column shows the allowable dry gas that can be produced by the average well in each of these fields.

Looking at the Foremost Field, the open flow is estimated at 10.5 million cubic feet per day, and it has been assumed that that well can be produced at 25% of the open flow which gives 2.6 million cubic feet per day dry gas allowable.

In the case of Viking-Kinsella, the 25% open flow production has also been assumed.

In the case of Pincher Creek, the open flow, raw gas, is estimated at 68 million cubic feet per day. The allowable dry gas has been taken at 20% of the open flow, multiplied by the 80% factor, to account for shrinkage and field use of the gas.

In the case of Jumping Pound, the allowable dry gas has been computed on the basis of 20% of the open flow multiplied by the 90% factor, to allow for shrinkage of dry gas. Those are the same factors I used previously.

In the case of Morinville and Picardville, and the other dry gas areas, the allowable has been



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taken at 25% of the absolute open flow.

In the 13th column, the number of wells required to provide the peak load capacity from the field is tabulated.

Referring to the first column, the annual daily dry gas requirements, the Canadian Western Company will require about 29 billion in 1953. That would be obtained by taking 67 million cubic feet per day on the average from Turner Valley, and 10 million cubic feet per day on the average from Foremost. There is a slight deficiency in 1953 in the amount of an average of 2 million cubic feet per day, which I have indicated as coming from Pincher Creek.

I wish to point out at this time that the pipe line gathering system as shown in our submissions shows the pipe line from Pincher Creek very close to Canadian Western and the Jumping Pound, the connection being made north of Calgary. For all practical purposes it does not matter whether the gas comes from Pincher Creek or Jumping Pound to supplement the Canadian Western requirements as far as the integrated gathering system is concerned, and I showed it this way for convenience because the pipe line passed by Calgary before joining with Jumping Pound. Such a connection would require a minimum of stub line facilities for getting the gas to Calgary.

Northwestern Utilities' demands would be met before 1953 by an average of 72 million cubic feet per day from Viking-Kinsella, and 12 million cubic feet per day from Leduc.

The Westcoast Transmission requirements





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will be taken care of by 50 million cubic feet per day from Pincher Creek, 25 million cubic feet per day on the average from Jumping Pound, 4 million cubic feet per day from Stettler, 15 million cubic feet from Morinville, and 3 million from the Picardville area. The Picardville area includes 4 fields, Picardville, Bon Accord, Legal and Excelsior.

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With respect to peak day or maximum daily dry gas, I have reviewed considerable data on Turner Valley and it is indicated that Turner Valley will be able to continue to produce 95 million cubic feet per day on the peak load up through 1957 based on the quantities of gas withdrawn as shown on this exhibit. I requested information regarding the capacity of the Bow Island field to deliver on peak days and received that information in a letter dated March 28th, 1950, from Mr. Gordon Connell. It was indicated that the present capacity of the field is 25 million cubic feet per day for peak days, and that the drilling of two additional wells is planned and that capacity can be expected to be 30 million cubic feet per day.

In 1953 with the available gas in Turner Valley, Foremost and Bow Island it is estimated that Canadian Western will be short on the peak day 46 million cubic feet. I have shown this gas as being available from Pincher Creek. Here again, as I previously pointed out, and I wish to emphasize this, that the gas could as well have been taken from Jumping Pound. For convenience it was shown coming from Pincher Creek. The maximum day dry gas for Northwestern Utilities is made up of 203 million cubic feet per day from Viking-Kinsella and 12 million cubic feet per day from Leduc. You will note that in the case of Leduc the average daily withdrawals of dry gas and the maximum daily withdrawals are the same, that is, 12 million cubic feet per day, inasmuch as this type of production from Leduc would be





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through a gasoline machine presumably and would require a constant load factor operation. Westcoast Transmission Company would receive most of their peak load from the north, inasmuch as the southern fields are required to a considerable extent, even in the early year of 1953, to supply the southern provincial system.

You will note that in the two total columns the total for the average daily dry gas and the maximum daily dry gas with Pincher Creek is shown as 52 million cubic feet per day on the average and 52 million on the peak day. Similarly, Jumping Pound is shown at 25 million cubic feet per day and 25 million on the peak day. It is again here believed that production from these fields would have to be at fairly uniform constant rate and they have been kept the same on the average day and on the maximum day.

Q Just one point there, Dr. Hetherington. You stated that the maximum daily demand for Canadian Western could be taken either from Pincher Creek or Jumping Pound, but if it is to be taken from Jumping Pound, would your 5 wells provide 46 million?

A No. If it has to be taken from Jumping Pound instead of Pincher Creek, as I have shown it, it would require 8 wells.

Q In Jumping Pound?

A In Jumping Pound instead of 5.

Q On this system there would be 3 less wells in Jumping Pound?

A That is correct.



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In the 8th column, which is the total maximum daily dry gas, the total peak load requirements for all systems is shown by fields. By dividing the total maximum daily dry gas required by the allowable dry gas per well, the number of wells required is computed and tabulated in column 13.

Turning to the next page, which is the second year, 1954, the same procedure is followed. You will note that the gas requirements of the Canadian Western system from Pincher Creek are increasing and the amounts of gas from Pincher Creek going to Westcoast Transmission Company is decreasing. This sheet follows the explanation I gave of the first sheet.

The next year, the third year, 1955, similarly follows the same explanation as does the fourth year, 1956.

Now, in 1957, the fifth year of export, it is estimated then an additional 12 million cubic feet per day will be available from Leduc. The production of Leduc has been assumed to split 12 million cubic feet per day to the Northwestern Utility system and 12 million cubic feet per day to the Westcoast Transmission Company. The loads used for Canadian Western and Northwest Utilities in the year 1957 are those given by Mr. Brownie in his year 1960, and in all the further exhibits or the further sheets of this exhibit those loads are kept the same. Now, admittedly that is advancing the load a little bit, advancing it by 3 years, but Mr. Brownie's figures for 1957 and 1960 were not a





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whole lot different, so we advanced the requirements by three years and kept them at that level throughout the rest of this exhibit.

Now, in the five year period 1958 to 1962, which is the second five years of export, or 13 years from date, you will note that the Canadian Western system is taking on a peak day of 90 million cubic feet per day from Pincher Creek and 26 million cubic feet per day from Jumping Pound. Twelve years from now Canadian Western will require the total of those two quantities, namely, 115 million cubic feet per day, which could not be obtained from Jumping Pound alone, with the number of wells that can be drilled in that field, so the Canadian Western system must around this time look for additional sources other than Jumping Pound if they were doing it without the help of the gathering system. The gathering system makes it possible to deliver the peak load capacity of Pincher Creek and Jumping Pound to Canadian Western while maintaining 100 per cent load factor on that portion of the system by using the gas for export during periods when it is not needed for Canadian Western. The requirements of Canadian Western in this year 1962 over and above the ability of Turner Valley, Foremost and Bow Island to produce is, as I pointed out, 116 cubic feet per day estimated.

In the column of total production, total maximum daily dry gas from Pincher Creek and Jumping Pound, the figures are 90 million from Pincher Creek,



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and 50 million a day from Jumping Pound, or a total of 140 million. So that twelve years from today it can be expected that Canadian Western will be taking 83 per cent of the peak load capacity of both Pincher Creek and Jumping Pound. They will be taking on the average, moving back now to the average daily dry gas, they will be taking 56 million cubic feet per day on the average out of a total of 140, or 40 per cent of the annual production from Pincher Creek and Jumping Pound.

In the previous five sheets I have indicated the peak load capacity of Turner Valley at 95 million cubic feet per day, and pointed out that that could be expected to continue until 1957. That is my estimate based on an analysis of considerable information. By the year 1962, however, I estimate that the Turner Valley will be able to produce only 50 million cubic feet per day. Foremost, on the production schedule that has been assumed here, has dropped from its original ability 15 million cubic feet per day down to 4 million. Bow Island has still been considered as being used as storage. You will note that no gas is taken from Bow Island on the average. In other words, the gas is stored in the summer time and taken out on the peak day at the rate of 30 million cubic feet per day and depleted during the winter time period.

Gas is shown as coming from Redwater for the Westcoast Transmission Company in the amount of 12 million cubic feet per day average and peak. In that regard there has been some conversation regarding





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whether Redwater would be economical. However, in the interests of conservation, it is assumed that this gas will be gathered just the way that it is planned in Leduc and that 12 million cubic feet per day will be available from Redwater. That is shown as meeting part of the requirements of the Westcoast Transmission Company.

Q MR. McDONALD: If it is not gathered it will drop out of the Westcoast deliverability?

A If the Redwater gas is not gathered and available it will drop out of Westcoast Transmission Company's available supply.

During this period the fields Athabaska, Boyle, Lac la Biche and Bailey-Long Island have been added to meet the requirements of Westcoast. Also, in this period, as given in Note A, it is estimated that casing head gas from Stettler will be about depleted and that dry gas production will start. And you will note that this is the first period when a number of wells is indicated for Stettler. Those are dry gas wells and have been estimated to indicate the number of wells required in an oil field. These figures for Stettler are on the basis of present estimates of reserves.

In the next sheet, which is the third five years, that is in the five year period 1963 to 1967, it is estimated that Turner Valley will be considerably depleted, that the ability to draw peak load gas will only be 25 million cubic feet per day, and that on an annual basis only 9 million cubic feet per day will be drawn on the average.



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With respect to the disposition of Pincher Creek and Jumping Pound gas, Pincher Creek will have a peak load deliverability in this year 1967 of 68 million cubic feet, and Jumping Pound will have a peak load capacity of 36 million cubic feet.

You will note under maximum daily dry gas Canadian Western, that the entire peak load capacity of Pincher Creek and Jumping Pound is required for the Canadian Western system. Let us look at the annual requirements of the Canadian Western system from Pincher Creek and Jumping Pound. There will be a total production from Pincher Creek and Jumping Pound in the sum of 68 and 36, or 104 million cubic feet per day on the average.

Q THE CHAIRMAN: Isn't that the maximum?

A Yes. Those are base load fields, though, and the maximum is equal to the average.

Q The average is not shown as all going to Canadian Western?

A No, sir, that is correct. The total production from the two fields is 104, of which 76 million on the average will go to Canadian Western, or 76 divided by 104, 73% of the annual production from Pincher Creek and Jumping Pound is required for the Canadian Western system.

Now, another item comes into this production schedule during this period. Refer to maximum daily dry gas Canadian Western requirements. Turner Valley is nearly depleted, Foremost is essentially





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depleted, 30 million cubic feet a day is available from Bow Island, all of the Pincher Creek and Jumping Pound gas is going to Canadian Western on the peak day, and there is still required 37 million cubic feet per day on the peak day. This gas is shown as coming from storage from Viking-Kinsella. Now, Mr. McDonald pointed out in his opening statement that we have shown storage in Viking-Kinsella because on the basis of the information we have at hand, it is a field that probably is susceptible to economical storage. The wells are not too deep, the pressures are not very high, the well capacities are good, and it is a field presumably susceptible to storage of natural gas. As Mr. McDonald pointed out, if another field should be preferable, then the gathering system would choose the best field for storage purposes.

Q MR. C.E. SMITH: Excuse me one moment. Are you referring to the 37 there, Doctor?

A Yes.

Q All right, thanks.

A You will note, Mr. Smith, that the 37 million cubic feet per day from Viking-Kinsella to the Canadian Western is on the peak day, and on the average day there is no gas from Viking-Kinsella going to Canadian Western. In other words, that peak day would be Pincher Creek and Jumping Pound gas which had been stored in Viking-Kinsella and brought back during the winter time when that line was not in use for Westcoast.

Q MR. McDONALD: While you are on that, Dr. Hetherington, the 37 would go to Canadian Western from



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storage at Viking-Kinsella?

A Yes.

Q And 31 from Viking-Kinsella would go to Westcoast?

A Yes. Westcoast would also require storage in Viking-Kinsella in the amount of 31 million cubic feet per day on the peak day. They would take no annual gas, there would be no net withdrawals from Viking-Kinsella for Westcoast.

Q In other words, this 37 million maximum day to Canadian Western and 31 million maximum day demand to Westcoast will come from gas that has been stored in Viking-Kinsella?

A That is right.

Q And it has nothing to do with the net reserve in Viking-Kinsella?

A No. In this submission only net withdrawals from Viking-Kinsella are by Northwestern Utilities Company.

Q That gas that was run to storage will have come from what source?

A The gas that was run to storage could come from any of the sources, any of the other sources hooked up. In all probability it would come from Pincher Creek and Jumping Pound.

Q That is in addition to storage at Bow Island too?

A That is in addition to the Bow Island storage.

Q MR. FENERTY: Just there so I won't forget it. This Bow Island storage, you carry it on for 30 million per day indefinitely? I do not see where you put it in Bow Island from any place.

A Well, that would be put in from Pincher Creek and





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Jumping Pound.

Q Well, have you shown that as withdrawals from Pincher Creek and Jumping Pound?

A Yes.

Q It is in this, is it? I do not see those amounts being withdrawn.

A Well, it won't appear as such, Mr. Fenerty. The average daily dry gas withdrawals from Pincher Creek is shown as 51 million cubic feet per day on the average.

Q Yes?

A Now, certain days of the year that 51 million on the average will not be required for the market, that gas would be put in Bow Island, just the same way as Turner Valley gas is now being put in Bow Island.

Q But when you come to total, the totals for use during that period for the various uses, plus the total for Bow Island, it is all accounted for?

A It is accounted for because the total for Bow Island, net withdrawals is zero, no net gas is withdrawn from Bow Island.

Q No. I am still not clear that the withdrawals from these various fields during the year, that in them are included the withdrawals that you store in Bow Island. You say they are?

A They are, yes, and the way you can tell that they are is to take the total of all the requirements and they add up to the supply.

Q That is fine.

THE CHAIRMAN: I wonder if we might adjourn now.  
(The Hearing then adjourned and resumed at 2:00 P.M.)



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Q MR. McDONALD: Will you just carry on, please,  
Dr. Hetherington? What was the schedule you were referring  
to?

A I believe I had reached the start of the fifth 5-year period,  
1968 to 1972. That is the fourth 5-year period of export.  
I will point out the differences in this Table and the previous  
Table. The amount of gas withdrawn from Leduc is increased  
during this period. It is understood that sometime between  
the 18th and 20th years of operation at Leduc that additional  
gas will be available from the Cretaceous zone.

Q I might interject there, Dr. Hetherington, that there might  
be also gas available from the gas cap?

A Yes.

Q There might be?

A There might be.

Q It depends on the status of the oil production in the field?

A Yes. Thank you, Mr. McDonald. So that that additional gas  
is both cretaceous gas and gas cap production.

The Provost field is added for  
Northwestern Utilities during this period. The gas total in  
the 5-year period - -

Q Pardon me, in regard to this Provost field do you show the  
number of wells to be drilled over the 5 years?

A Yes, the total number is three wells. Their average pro-  
duction 1.4 million cubic feet per day.

Q Yes. That Provost field is required to maintain the peak  
load delivery for the Edmonton system or the Northwestern  
system?

A That is required to maintain the peak load for the Northwestern





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Utilities. Some gas - the annual withdrawals are relatively small. The reason for the need of Provost is that the Viking-Kinsella field after the 25 years will be drawn down to such an extent that it is indicated it will not meet the peak load requirement for Northwestern Utilities.

Q Yes?

A The next Table is the 5-year period from 1973 to 1977 and is the fifth 5-year period, or the 25th year of export. Let me refer back to the previous statement. This period of 1968 to 1972, that is 20 years of export and it is indicated in this Table that both the local systems and the pipe line company will have a supply of deliverable gas for 20 years of export. Referring to the next Table, the fifth 5-years' period, the production from Leduc is taken as 42 million cubic feet per day into the Northwestern Utilities' system, and 9 million cubic feet per day into the Westcoast system, on the average. During this period between 1973 and 1977 it will be impossible to get full delivery for export. At the end of the period, which would be 25 years after the start of the export, in 1977, Westcoast Transmission Company would be deficient, based on present reserves, in the amount of 146 million cubic feet per day on the peak day and in the amount of 87 million cubic feet per day on the average. That is shown on the last line of this Table, headed "New Discoveries." In other words, in 1977 the export pipeline would have to look to new discoveries.

Q THE CHAIRMAN: Do you mean by "new discoveries" fields listed here in Table "A" that you have not dealt with here, or do you mean "new discoveries" in the sense of new discoveries of wells ?



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A I mean in the sense of new discoveries, whether they were an extension of the proven field or entirely new discovery wells. I have used all of the fields that are geographically located such that they can be used, unless in the case of the Pouce Coupe. The reserves in the Pouce Coupe field could be used if they were increased several-fold. Now in this period again, as in the previous two periods, Canadian Western would require the entire production of Pincher Creek and Jumping Pound, both on a peak day and on the average.

Q MR. McDONALD: Turner Valley is completely out of the picture by this time?

A Turner Valley is completely out of the picture. I failed to mention it is completely out of the picture in the previous sheet, that is 1972.

Q Yes?

A During the 25th year of export, it is assumed that a small amount of gas would be drawn out of Bow Island. Therefore the available load is reduced from 32 million down to 15 million per day. That average withdrawal for Canadian Western of 6 million cubic feet per day is from Bow Island. In the last sheet, which is in the 2-year period 1978-1979, which would be 30 years from this date, the deliverability of the Canadian Western and Northwestern Utilities is still maintained and the deliverability of the export pipeline is deficient by 197 million cubic feet per day on a peak day and an average of 89 million cubic feet per day throughout the year. This deficiency in the 30th year would have to be handled by new discoveries for export. At the end of this period you will note that the number of wells previously indicated that could be drilled in the various fields are





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shown. In the case of Pincher Creek the maximum number of wells shown is 20. In Jumping Pound, 13. In Stettler, 3. In Morinville, 61. Picardville, 26. Athabasca, 6. Boyle, 1. Lac la Biche, 6. And Bailey-LongIsland, 3. The Provost field has enough room for 85 wells and the Viking-Kinsella field has enough room for over 500 wells. But it was only necessary to use 413 of those locations.

In regard to the number of wells in Pincher Creek, I would like to point out that only 16 of those would be required during the first 20 years of export. The last sheet is a summary for the 30 years to 1980 and gives the quantities of gas in billions of cubic feet.

Q MR. FENERTY: Could I ask a question on that last 2-year period? It is a small matter, but I notice that in the previous period from 1973 to 1977 you said that all the Pincher Creek and Jumping Pound production would be required, 57, 57 and 23 and 23, but in this sheet for 1978 and 1979, the 2-year period, you have all Pincher Creek required for average 48 and 48 and Jumping Pound 21 and 21, but in Pincher Creek you have a total of 54, 48 for the Canadian Western and 6 for export. I wonder how they come back into Pincher Creek for export?

A I am inclined to agree with you, I will have to think that over for a minute. There is considerable flexibility, Mr. Fenerty, in this Table but I am sure that is an inconsistency. I believe now - -

Q You will give that to me later?

A I believe that that should be that the 6 million shown coming from Pincher Creek should have come from Viking-Kinsella.



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Q I see. Thank you.

A In the summary sheet there is contained quantities of gas in billions of cubic feet used during each of the 5-year periods and used cumulatively since 1949 from each of the fields for Provincial and export pipeline requirements. The first column shows prior to export, used in Turner Valley, Leduc and Viking-Kinsella, based on Mr. Brownie's estimate of the requirements of those companies. The first 5-year period, second, third, fourth and fifth. The fifth year period the uses are shown during the period and cumulatively since 1949. The next to the last column shows the 30 years' production to the year 1980 and the last column shows available marketable gas as given by Dr. Nauss. The amount of gas used in the 30 years can be compared to the available marketable gas. In Turner Valley the entire production is assumed taken during that period. Essentially all of the gas in Foremost is taken. A good part of the gas in Bow Island is taken. Essentially all of the gas in Redwater is taken. 400 billion of the 640 billion available in Leduc and Golden Spike is taken. In Provost about 60% of the gas is taken. In Viking-Kinsella about 86% of the gas is taken. In Pincher Creek something over half of the gas is used in 30 years. In Jumping Pound again something over half of the amount of gas is used. In Stettler essentially all of the gas is used. In Morinville about 65% of the gas is used in 30 years. In Picardville essentially all of the gas is used. Then in Athabasca, Boyle, Lac la Biche and Bailey-Long Island lesser amounts have been withdrawn compared to their available market gas. So that over the 30 years all the needs of the Province and the needs of the export total approximately





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3.6 trillion. Now of that 3.6 trillion about 2/10ths of a trillion was used for export based on new discoveries. So that the actual consumption from the present reserves in 30 years will be 3,368 billion cubic feet and based on Dr. Nauss' estimate of available marketable gas totalling 6,117 billion cubic feet, the gas reserves of Alberta exceed 50 years.

Q MR. McDONALD: The gas reserves of Alberta excluding export exceed 50 years. Excluding the 30 years of export?

A No, including that.

Q Including that?

A Including that, yes.

Q MR. FENERTY: At a price?

A Oh, yes.

Q MR. SMITH: But including the 30 years of export?

A Well I do not want to be too technical on this thing. It includes 30 years' export with the exception of the part that was deducted for new discoveries so that it would not be 30 years of export complete.

The charts following the schedules have been made up for each of the gas fields and I want to point out two discrepancies in the Pincher Creek and Jumping Pound charts. During my last cross-examination by Dr. Govier he indicated that the line of formation pressure - gas in place should have been a curve and whilst I agreed with him it did not look like it on the chart. I have since gone back over those charts and plotted them myself and the line is a curve in both Pincher Creek and Jumping Pound deliverability charts. But this does not have any effect on the results of the deliverability schedule, however, because the second chart which is entitled "Alberta Gas Fields Average Well Open Flow - Withdrawal Characteristics", was used in



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developing the schedules of production and this chart is plotted correctly.

Q MR. McDONALD: There was one other item I might question you on and that is in regard to the open flow at Pincher Creek. If you will recollect this morning Dr. Nauss referred to the open flow calculation in the neighbourhood of 14 million average?

A Yes.

Q And then he also referred to the conversation with engineers of the Gulf Company in which they discussed the matter of 10 to 12 million open flow average. What was the factor you used?

A The highest flow I have taken for Pincher Creek is shown in the first year, in the year 1953, as 10.9 million cubic feet per day allowable dry gas. That corresponds to 12.6 million cubic feet per day raw gas, which is a lower figure than Dr. Nauss indicated as available and it is in the same range as the engineers for the producer indicated.

Q That is 10 to 12 million cubic feet per day

A In the 5th year, that is 1957, the production is down to 11.2 million cubic feet per day allowable raw gas. That figure is 9.0 allowable dry gas.

Q Would you refer to Dr. Nauss' exhibit 80 again? This is the absolute open flow graph of the Pincher Creek field?

A Yes.

Q In arriving at the slope in your graph for the Pincher Creek field, what was the slope that you derived from Exhibit 80?

A I used an average slope of 1.15. That slope is the change in flow with the change in squared pressure drop. Now the charts, the curves shown in this Exhibit 83 - -





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Q 80.

A - - 80, curves 2 and 3 have a slope of something in the order of 6/10ths and curve 1 has a slope something in the order of 1.2. I would point out here that if you start with a given open flow, the higher the slope used the more conservative the figure, because it gives a lower flow for the same pressure conditions. I took the average of those two, which was approximately 1.15. That was the same slope that I got by averaging the data from the Jumping Pound field and inasmuch as the two are fairly comparable, relatively comparable, I used the same slope in computing the deliverability data.

Q Now there is one question about the design of the gathering system, Dr. Hetherington. Would implementing a program of production for the 30 years' requirements change the design of the gathering system that you have already submitted to the Board?

A It would require minor changes in the north. The capacity of the gathering system I submitted is the same as given in this deliverability schedule for the southern part of the Province. Now by virtue of the fact that Canadian Western would take off gas from Pincher Creek and Jumping Pound that additional peak load would have to be made up from the north, so it would mean somewhat of a modification of that design, a minor modification in line sizing near to Edmonton.

Q MR. FENERTY: And a new pipeline to Kinsella?

A It would mean a new pipeline to Kinsella when that is necessary.

Q MR. McDONALD: Unless some other field was used for storage other than Kinsella?

A That is correct.

MR. McDONALD: That is all we have on this point



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just now, sir.

CROSS-EXAMINATION BY MR. FENERTY:

MR. FENERTY: If the Board pleases, Mr. Davies and myself have not had an opportunity in one evening of going over something which has taken some weeks to prepare. I think perhaps we should all have some opportunity, if it proves necessary, for cross-examination after further detailed examination of the exhibits has been made. But I have a few questions that might be helpful at the present time to ourselves and perhaps to everybody in preparing for that. I would not want to close my cross-examination.

THE CHAIRMAN: Oh, no.

MR. McDONALD: If I might interrupt and say that we have not included in this submission the deliverability for Pendant d'Oreille or Pakowki Lake area and the Princess field.

A And Pouce Coupe.

Q And Pouce Coupe. Those charts have just arrived from New York now and we will submit them in the morning.

Q MR. FENERTY: I would like to discuss a minute with you the statement which to me, I must confess, was rather startling that you had your 50 years' supply. I see it here in the available marketable gas. For instance, we will discuss Pincher Creek 30 years' production 683 and available marketable gas, 1252, which leaves substantially 50% as you say available and deliverable in the reservoir. When you said that did you mean it was available and deliverable within that remaining 20 years or 30 years of the 50?

A I did not mean to infer that.

Q No, but some of us might have got that impression?





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A Oh, no.

Q That that was what you were inferring. It might be 100 years?

A Well I do not know what it would be. It would be a period of time.

Q We can take it, cannot we, that if you need all the Pincher Creek and Jumping Pound gas for the Canadian Western, going back to somewhere in the 60's, and you have got your maximum number of wells by the 30-year period, your pressure is going to go down is it now?

A Yes.

Q And if you need your maximum production from those maximum number of wells at the end of the 30 years the pressure continues to go down and you are not going to get that maximum production with the decreased pressure, are you?

A That is shown in these exhibits, each 5-year period, the amount of gas that can be delivered from Pincher Creek and Jumping Pound is decreasing and after 30 years it will continue to decrease.

Q It will continue to decrease?

A Yes.

Q So that in that case at the end of 30 years for Canadian Western then you have not got that amount of gas after the 30 years, average daily production?

A It is a little more than that. You need not only everything from Pincher Creek and Jumping Pound but you need some help from the North.

Q And taking those two you will get less and less from them after the 30 years down to 50 years?

A Yes. So that the help you need from the north, of course, increases.



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Q You will have to get more from the Edmonton and tributary territory or some other wells?

A Yes.

Q Perhaps you might have to drill up to even 500 wells in this other field instead of only 413, something like that. Where would you get it from?

A Well I have shown where the deliverable gas would come from for 30 years. I have not considered it further than that.

Q There is no virtue in that 30 years. I am the one who is responsible for the 30 years because I asked you to project something over 30 years. But what I was trying to get at was where I could break down the original set-up. But that 30 years was not there. And then we import this grid system and as far as the 30 years is concerned really the thing we should be talking about is 50 years. You recognized that and told me you had gas, deliverable gas, in place for 50 years. I want you to make it quite clear if such is the case that you did not have deliverable gas available for 50 years during the 50 years?

A You have misunderstood the statement.

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Q Oh, I am just asking. I am clearing it up. Did you mean to say that?

A If this will clear it up for you I will restate it because you have not stated it correctly.

Q All right, you clear it up.

A I said that this exhibit shows that there is deliverable gas for Provincial requirements for 30 years.

Q Yes?

A That there is a gas reserve in excess of 50 years and that over and above those abilities to meet local requirements there is in excess of 20 years deliverable gas for an export pipe line.

Q Now, take that 50 years. Just repeat that again. There is what for local consumption is what I want.

BY THE REPORTER READING: "I said that this exhibit shows that there is deliverable gas for Provincial requirements for 30 years. Question: Yes? Answer: That there is a gas reserve in excess of 50 years and that over and above those abilities to meet local requirements there is in excess of 20 years deliverable gas for an export pipe line."

Q MR. FENERTY: All right, I still want to ask you what is wrong with my phrasing, because quite frankly I think there is a nigger in the woodpile in the way you have stated it. Now, can you tell me now. If you were to extend this very admirable doctrine to show 50 continuous years, that is 20 more than the 30, of deliveries to the Canadian Western system, would you show how it would be gotten out in those various wells



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and delivered to Canadian Western for the 30 years?

A I think I can answer your question very simply. This does not purport to say in our opinion in the testimony as indicated there is 50 years deliverable gas. That was not the intent. In this last page of the yearly calculations the Foremost field is drilled up, the Bow Island field is drilled up, Pincher Creek and Morinville and Picardville, all the fields are drilled up except Viking-Kinsella. Now, drilling them up to the 570 wells, that could go into Viking-Kinsella. This table could be extended X years. It should not be further than 30 years. You can extend deliverability with the available acreage for drilling wells in the proven reserves.

Q I am not criticizing what you did there. I am still worrying about the statement that there was deliverability of gas for 50 years for the Canadian Western.

A Well, nobody made that statement.

Q Then you have not got in proven reserves deliverability for the Canadian Western for 50 years, that is what I want?

A No.

Q And you can not find it on present proven reserves?

A Not deliverability. The reserve is there but it is not deliverable in the later years.

Q But you can not heat the house with the reserves that can not be delivered?

A Fairly obviously, yes.

Q You haven't got it. And I want to read to you this statement of Mr. Tanner in the House to Mr. Prowse,





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"Mr. Tanner said both he and the Premier had announced the Government's policy would be not to allow export unless present and future needs for the next 50 years were satisfied. The Government also announced that price of natural gas in Alberta must not be affected by any export."

MR. C.E. SMITH: I think we had better have that marked. I should like to see what is in it. You do not mind marking it as an exhibit?

MR. FENERTY: Certainly. I assume it must be so because it is in the newspaper. I would be very pleased to have it marked, then we will have a permanent record of it.

NEWSPAPER CLIPPING PUT IN  
AND MARKED EXHIBIT 100.

Q MR. FENERTY: All right. We are in this position, you have made a very noble effort but you have not got it within the four walls of that statement.

A I wouldn't say so, no. I do not think you can take the Premier's statement and turn that in close to numbers. I am sure it must be governed by judgment.

Q Whose?

A I would say the Conservation Board's, and whoever is going to decide on granting export.

Q Well --

A Let me finish, please. These figures permit the authorities to apply their judgment in an interpretation of the law. Now, that is what I hoped, that this exhibit would be of assistance to those in authority, and at that point that is as much information as I can give them.



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Q Well, I do not think you and I can discuss that particular thing. Possibly the Board with the assistance of their Counsel are more competent than both of us to decide what their position is, but as far as the written word is concerned, if that is accurate you have not got it. Let us be frank. That is right, isn't it?

A No, I won't say that because I do not believe that the Premier said that gas had to be deliverable or anything else. You have a statement from the newspaper. I have set forth here, I believe, almost exactly your requirements that you stated in the last Hearing.

Q You have been trying for some months to modify the Government's policy. I am assuming that that statement is correct. Well, you tell me this, that you have not got that. Can I get you down to a plain statement?

A No, you can not on that.

Q I never have been and I thought I would from you.

A It has been your contention that I have been trying to modify the Government's policy. I will try to put it differently, that I am showing to the best of my knowledge what can be produced from these reserves. Now, I have shown what I think is about the most that can be produced from these reserves and I am presenting it to the authorities for their decision.

Q And all I am asking you is, if the Government's requirements are present proof of 50 years' internal supply, on your own figures you have not done it. Now, isn't that fair?

A No, that is not.





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Q Oh well, we will leave it.

MR. McDONALD: Yes, I think, Mr. Chairman, that the witness has answered the question. He has made it plain what he intended to do and stopped there. There is one thing --

MR. FENERTY: I won't labour it, I won't press him on it, it is embarrassing.

MR. McDONALD: No, it is not embarrassing.

Q MR. FENERTY: All right. Well now, let us get to some things perhaps we won't disagree on. Who is going to handle the distribution, taking gas to the north and back to the south? Would the export company do that under this plan?

MR. McDONALD: I can answer that. The intention is the Provincially incorporated company will handle the gathering system and it will be subject to the Board of Public Utility Commissioners of Alberta.

Q MR. FENERTY: Yes. And have you by any chance analyzed the report or submission filed by Mr. Milner's company, the Interfield?

A THE WITNESS: Yes, I have.

Q And does your system of handling the gas correspond with that one at all, do you know?

A Why, it would be very similar. Essentially the same fields are connected, sir.

Q I have not quite understood it. I have had it explained to me since but as a matter of record, as I understand it, when you take gas from the northern field, Kinsella and Viking and so on, and use it in the south during



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the period of peak load, perhaps prior to using it you may have to supply that in advance instead of afterwards, and that gas is replaced or stored in Kinsella or any other available storage, we will say, -- you use that because it looks like a good one -- if you did use Kinsella your only replace in that field that portion of the gas withdrawn from it which was used for supplying areas other than the northern area?

A That is correct.

Q I mean, you are not replacing what they use in Edmonton from the south?

A That is correct.

Q I will make sure they don't do that. Yes, and it follows then that throughout the years what will be necessary is to take a certain amount of gas from the territories tributary to Calgary and storing it either in Viking-Kinsella or any other areas that might be best available and subsequently returning it to Calgary and adjoining areas in times of peak load?

A Yes.

Q And somebody is going to pay for that, I take it?

A Certainly.

Q And you suspect the same as I do, the people that will use it will pay for it, don't you?

A Yes.

Q You have not any part in working over the expense of those operations, that is not your field?

A No, I have not, but I think I can point out this to you, Mr. Fenerty, that even if export were not used in the





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later years, 25 and 30 years, Pincher Creek and Jumping Pound are inadequate to supply the Canadian Western system so that you would have to look towards storage or some other source in any event.

Q You say they will be inadequate?

A Yes, sir.

Q And then as the result of export and the use of part of those reserves over a period of 30 years, they will become inadequate much quicker, won't they?

A Yes.

Q Then, as you say, the consumer probably pays, he always does in the end, I have found. His expenses are going to be increased much quicker by reason of them becoming inadequate quicker?

A No, I think the reverse is probable. I can only speak of generalities here rather than in Mcfs. but by using export during the initial years, subsidizing the Canadian Western system, and that is what they would be doing by carrying the bulk of the transportation costs and giving those facilities to Canadian Western on the peak loads when they require them, the cost could probably be reduced to Canadian Western.

Q When you say subsidizing them, I take it you mean by that, export would be carrying more than its proportion --

A Well --

Q Just a minute. See where your statement leads -- more than its proportion of part of the cost of that system. Isn't that what you mean?

A I would rather not argue about that, I would change my



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word. What I meant is the incremental cost to Canadian Western would be more than if they had to do the whole thing themselves and to that extent it would be subsidizing them over what they would have to pay if they did it themselves.

Q There is no evidence on that. That is a rather interesting point. I was rather hoping somebody would give us evidence on that. You think there is a possibility if the Canadian Western has to look elsewhere in the very near future it can look elsewhere more cheaply as a result of export than it could otherwise, is that it?

A Taking your whole future picture into account, I believe that that is a correct statement, yes.

Q Do you think that could be worked out to be shown as so or just a hope? I am not asking you to do it.

MR. McDONALD: I might point out, Mr. Fenerty, that the only point that is involved there is that nobody can tell what the Canadian Western plans are, how much money they are prepared to spend, where they want to go, or how they are going to do it. That is something for them to establish, but we can put in what we can do, that is about the size of it.

MR. FENERTY: Perhaps they will put in what they can do.

MR. STEER: They will do whatever is necessary.

Q MR. FENERTY: Now, just a few details on the figures, and I appreciate that they may not have as much significance as they otherwise would in view of Mr.





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McDonald's very frank statement. The only result of them may be to increase the figures at the bottom of certain columns, the amount you require for new discovery, which is one of the troubles on export. I would like to go over some of them with you anyhow. In the supplementary exhibit 31 when you extended the Jumping Pound and Pincher Creek fields to 30 years --

A Yes.

Q We had a figure there which you agreed with me was correct of 300 at the end of 30 years, and I note in this one you have 345 with the same number of wells in both cases.

A Well, that just means that the wells were drilled sooner, the wells were assumed to have been drilled sooner in this later exhibit, which would give a greater 30-year production.

Q Stepped up a little?

A That is right.

Q And that would account for the increase for that period?

A Yes.

Q You might get less later on but you have that much in 30 years?

A Yes.

Q The same number of wells but drilled sooner. In Pincher Creek you say 662 against 683. That might be accounted for by one well being drilled a little earlier or something like that?

A That is probably the reason for it, yes.

Q Now, I think you told me in examination before, I think



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you were the gentlemen who told me, that when it came to sitting down and mapping out a development program by a company having a large field, it was a somewhat complicated calculation and involved economics in determining how many wells they might profitably drill to get at the same quantity of gas and so on?

A Yes.

Q And have you anything along that line from any of the companies concerned which indicates to you that the Gulf will drill 20 wells, or that the Shell will drill 12, or was it 10. Have you any such assurances from anybody?

A I have talked to no one on it. My assumption here is that there is space for these wells on 640 acres, which is, in many cases an economic spacing, and it is my assumption that where there is space that the wells will be drilled.

Q MR. McDONALD: Provided that there is a market?

A Of course, provided there is a market for the gas.

Q MR. FENERTY: But it is an assumption. I mean, we have not been provided with any plan of that kind, which you say has to be worked out before producing any? And you do not know whether it would be 10 or 20 wells for the Gulf when they worked it out?

A No, I don't know what their results would be.

Q Now, I want to turn to Golden Spike, Leduc-Golden Spike. In the last two years, that is, at the end of the 30-year period, Leduc-Golden Spike, you have got an average there of -- average daily dry gas 66. That is in the





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last two years. Now, you have no data to go on from which you can determine whether or not those wells will be oil wells at that time or just gas wells?

A No. I have discussed that matter with Dr. Nauss, who is familiar with the geology in Leduc, and for the purpose of this submission we have made certain estimates or forecasts, whatever you want to call them, that in 1972 it will be possible to start to produce the gas cap and that some of the cretaceous zone gas will be available.

Q I gather from your figures that you have made these figures on the basis of gas wells, not oil wells?

A Yes, that is correct.

Q MR. McDONALD: After 1972?

A After 1972. Prior to 1972 it is assumed that this gas will be casing head.

Q MR. FENERTY: Well now, let us take the effect that could happen, continued oil wells. It would change the gas available very materially, won't it? I will put it this way, I will tell you what I am driving at. My information is that in the case of oil wells then you will only have recoverable or usable perhaps 50% due to the great number of light fractions. Do you know anything about that?

A No, I would assume it is whatever Dr. Nauss shows in his table as the factor for going from raw gas to marketable gas.

Q You personally do not know whether that suggestion is correct with this gas produced?

MR. McDONALD: Table A shows we allow 40% for



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those fractions.

Q MR. FENERTY: Well, I won't quarrel whether it is 40 or 50, but you are not allowing that percentage for these wells throughout this period, are you?

A THE WITNESS: Well, up until 1972 that percentage is allowed.

Q Well now, let me shorten it.

A Wait a minute. The answer to that question is "yes".

Q I don't know whether I ought to now. Let us put it this way now, whether it is 40 or 50 per cent, within that range, in the case of the gas associated with production of oil wells in that area, if you like, you will only expect to have usable some 50 or 60 per cent of that gas that is driven off, is that right?

A Yes, according to Dr. Nauss' report.

Q I suggest that 50 and Dr. Nauss says 60, is that right. All right. Was Dr. Nauss' usable 40 or 60?

MR. McDONALD: The 40 takes into account all the use, shrinkage in the plant.

Q MR. FENERTY: And is that what you would have remaining or what he will use up?

MR. McDONALD: No, 60 per cent would go out of the end of the plant and be marketable.

MR. FENERTY: I suggested : 50 and Dr. Nauss said 60.

MR. McDONALD: Yes, that is right.

Q MR. FENERTY: Now, I want you to think of that in the light of what Imperial Oil have been good enough to tell you with reference to production that they count



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on from there. The second page of their volume here, "It was emphasized, however, during the Dinning Commission that the plant design was predicated on 24,000 Mcf. per day." They are dealing there with what? What is that, a scrubbing plant or a recovery plant? What was that plant, 24,000 Mcf. per day? That was the absorption plant, was it?

MR. McDONALD: Yes, that was the new absorption plant.

Q MR. FENERTY: Designed for 24,000 Mcf. per day. "On the basis of subsequent reservoir data we are now of the opinion that water influx from the D-3 aquifer will occur," and it might reasonably expect it to be reduced. I am looking for the place where they had been at the present time contemplating no enlargement of the plant. That was said there.

MR. McDONALD: That was on the first page?

MR. FENERTY: Here it is, yes, "Can be ultimately expanded to 24,000 Mcf. per day." "In other words, the plant capacity will initially be limited by compressor capacity to approximately 19,000 Mcf. per day, but can ultimately be expanded to 24,000 Mcf. per day by installation of additional compressors. "

A I would appreciate it if you would go ahead and read that because I think the exact wording is necessary.

Q Here it is. We had better read it. I am trying to shorten it and I am mixing it up, I realize that. "Process facilities, utilities and services are designed for a maximum throughput of 24,000 Mcf. per stream day.





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Based on estimated gas volumes available from Leduc-Woodbend field in the next year or so, compressor capacity for only 19,000 Mcf. per day at the estimated delivery pressure from the low and high gathering systems, is being installed. In other words, the plant capacity will initially be limited by compressor capacity to approximately 19,000 Mcf. per day, but can ultimately be expanded to 24,000 Mcf. per day by installation of additional compressors. The total annual field gas production will be governed by: (a) type of primary reservoir drive -- our present thinking is that there will be a bottom water influx in the D-3 reservoir and the gas-oil interface should not be moved appreciably. (b) The outlet or market for crude oil. Considering these factors, it is our general opinion that the ultimate plant capacity of 24,000 Mcf. per day should not be exceeded for about 5 years." Now, during that period that would mean, applying my 40% factor, that you would have 12,000 Mcf. per year.

A This figure refers to dry gas from the plant.

Q What?

A This figure refers to dry gas production from the plant. The input to the plant would be greater.

Q So that you still have your 24?

A Yes.

Q DR. GOVIER: Dr. Hetherington, are you sure of that? My impression was the other way.

Q MR. FENERTY: I think it is the other way.

DR. NAUSS: 24 million per day is the inlet



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to the plant. The capacity out from the plant is 20 million per day, but this 40% has already been taken into consideration in Dr. Hetherington's work.

MR. FENERTY: Well, it comes off, doesn't it, from the 24, downstream from the absorption plant?

MR. McDONALD: All that goes off from the absorption plant is the shrinkage in the absorption plant.

MR. FENERTY: 40%?

MR. McDONALD: No, that will be 20%.

MR. FENERTY: What you ultimately deliver will be half of what went through the absorption plant?

THE CHAIRMAN: I think Dr. Nauss is taking that 40%, he took the gas in place and said there would be a 40% loss.

MR. FENERTY: So you think it would be the full 24?

THE CHAIRMAN: No, there would be shrinkage through the absorption plant.

Q MR. FENERTY: 20% would be a fair figure then?

A THE WITNESS: Yes.

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Q It said only 5 years?

A Yes.

Q Then....

A I would point out there, Mr. Fenerty, that for five years we took the production at 12 million cubic feet per day.

Q Oh, I see?

A And after five years expanded it to 24, and in the 10th year period, expanded it to 36.

Q Yes. Now, there was a reference here, and Mr. Brownie is going to file it, of an opinion expressed by Mr. Ralph Davis giving an estimate of only 600 billion feet in Viking-Kinsella. If that estimate happened to be accepted by the Board, I take it from what you have now, the only effect of that would be, it would cut down the amount available for export, and you would have to look for a greater amount from new discoveries?

A Yes.

Q And so that with all these things, I am asking if, for instance, you have taken the load factor for your export pipe in computing it at the low extreme of 58%?

A It was taken at 58%, yes.

Q And Mr. Poor in giving us the figures from 58 to 100, said he was trying to give us the two extremes. I think extreme is the word that he used. I will get it. That is the word, I think. I have the reference. Just a minute, we will get it. I may be wrong.

MR. McDONALD: I think he used the word "extreme" in taking one end and the other of the table.

Q MR. FENERTY: Dr. Hetherington, I asked, dealing with the costs from 19 cents down, -



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"Q Well, because it wouldn't be 100%, take it down the middle, if you like, take 70%?

A No, it is more than that. All I am trying to do is to make the point that I have tried to show here. I have shown the two extremes."

Now, what he is referring to is the 58% and the 100%. That is what I am talking about, and I see you have taken one of the two extremes that he refers to?

A Well, I took the market estimate by Mr. Sample.

Q Yes, but I mean that is the lowest load factor that was contemplated by anybody?

A Yes.

Q Yes. And if it becomes higher then again it just increases the amount that you have to take from some other place?

A That is correct.

Q And have you made any calculation what it does to your position if you provide for internal supply for 50 years and you have to get the rest from new discoveries, where do you sit then?

A I am not sure I understand what you mean.

Q Well, assuming that you have to provide for internal supply for 50 years, are there going to have to be new discoveries or not?

A I would have to know what your plan is for providing for those requirements. Mr. McDonald pointed out that we have made no work-ups or studies of any alternative plans that you might have for doing it a different way.

Q No, you are getting back to the position you were a few



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weeks ago.

MR. McDONALD: Mr. Fenerty, what do you mean by "supply is 50 years' deliverability to the last day of the 50th year of a maximum day, is that what you mean?

MR. FENERTY: No, I am not saying continuous for 50 years. I am saying if you have to provide for or show where we can get a 50-year supply from now, for a period of 50 years, out of the proven areas.

MR. McDONALD: You mean deliverable?

MR. FENERTY: Yes, deliverable, of course. The Doctor and I agree with that, I think.

MR. McDONALD: Yes.

Q MR. FENERTY: That 1200 in place doesn't mean anything, that is just window dressing, that stuff in place after 30 years, I am talking about deliverability?

A I don't think the engineers would agree with you necessarily.

Q Deliverable gas, that is what I am talking about.

MR. McDONALD: Yes.

MR. FENERTY: Let us say it once more... If you were called upon to show as a condition of export where there was 50 years' deliverable supply to meet both peak and average usage for 50 years from now, and it is going to be obtained out of the existing area, how much does that leave you to get from new discoveries, have you any idea?

A I haven't made that calculation, Mr. Fenerty.

Q As a matter of fact, can you tell me this, am I right in surmising that if you have to come within such a limitation, do not let us talk about whether it is reasonable, but just if you have to come within it, that you cannot find enough





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gas available at this time left over to justify the building of a pipe line.

A Well, I haven't made that calculation, as I point out, and I do not see how I can answer that question.

Q I see. Well, now, I am not going to get into a discussion with you whether it should be part of this case, but you have not done it, have you?

A No.

Q No. And you would not like to talk with me about what you suspect, I suppose?

A Not unless I did it.

Q I can imagine you wouldn't on those 50 years. Now, Doctor, you told me that you could find some place where you could meet those 30 years, and you came pretty close to it?

A Yes.

Q Do you think you could find a place where you could meet this 50 years and leave enough to finance it? If you think so I will ask you to try; if you do not think so, you can stop, so that you can get out of a tough job, if you want to?

A Well, as I say, I haven't made any figures on it. I would want to try it before I would say whether I could do it or couldn't do it.

Q I see. I understand it is a tough thing, and you do not like to hazard a guess without going into it further, that is it?

A That is right.

Q Well, all right. Now, I gather from what you say that you have largely relied on the Gas Company's figures for consumption?



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A Yes, I have on the exhibits presented in this Hearing.

Q I perhaps might have asked Mr. Brownie, but I will ask you. I note here that the maximum daily dry gas and your average daily dry gas of the Canadian Western continues constant over, well, pretty well across since 1960.

MR. McDONALD: Yes.

A I took Mr. Brownie's figure for 1960 and used that as my figure. I advanced it 3 years and then kept it constant from then on out.

Q MR. FENERTY: Would you gather from that estimate that consumption is not going to increase after 1960?

A I did not make that particular estimate. I referred to Mr. Brownie's exhibit here where he said it was difficult to forecast the future, but that he thought the 1960 figure was a good representative average for the next 30 years. I believe that is what he said.

Q I guess that is right. Is that what you have been doing in other computations you made in other Hearings? I mean, do they figure down in the States that it stands still after 1960?

A Well, it is a very common thing. In fact, in my previous exhibit I figured that the Westcoast Transmission Company would build up to a 5-year load and remain at that load.

Q You are making plans for increased consumption of gas, and that is no doubt based on two things, one is salesmanship and the other is increased population?

A Up to the 5th year, yes.

Q And then constant after that?

A And then we have got the figures constant, yes.





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Q I am trying to find out why everybody thinks that in either 5 or 10 years the world stands still? Do you know why it is done?

A I know several reasons why it is done, or why it is used as an engineering approximation. For example, our company has analyzed the taking on of loads of various companies when they were converted from manufactured gas to natural gas, and we found, there were different differences between companies, but the thing I used as a rule of thumb in figuring how a company is going to take on a load, is that they will take on about half of the estimate the first year.

Q I get it.

A And half of what is left the next year, and by the third year they have about 85% of the load.

Q Yes?

A The load increases rapidly, then levels off. The load increases rapidly at first, and levels off.

Q But this is really a young country, it is just beginning to find itself?

A Yes.

Q You would expect a little increase in the population in the future, anyway?

A Yes, I would expect it.

Q For domestic loads, anyway?

A Yes.

Q It would not stand still 10 years from now, it might be less, but never the same?

A Yes, I think that is right.

Q And here again there would be that much more to be shown?

A If additional gas were required over and above our estimates



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it would advance the date when Westcoast Transmission Company would have to look to new discoveries.

Q I will try to shorten this up. Now, I gather that in working out this plan, as has been done here, you, in effect, leave the areas tributary to the Northern distribution system intact, except insofar as they are used for that area?

A Yes.

Q You take something out of it but you put it back, they are left intact?

A Yes.

Q The Northern distribution system remains secure in areas for its use, and in working this out you have not found it practical to reserve any particular area in acreage for the Southern distribution system?

A Yes.

Q That is so, isn't it, you have not?

A Yes.

Q Yes. And that is going to result in the earlier exhaustion of the areas tributary to Calgary because of export? You have already gone over that?

A If additional gas is taken.

Q But no acceleration of exhaustion of the areas tributary to the Northern distribution system because of export, that is right, isn't it?

A Yes.

Q That is unfortunate but you say that just can't be helped, is that it?

A Well, I may mention a few things here in that regard. Mr. Brownie has pointed out that Canadian Western require-



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ments could be handled by Turner Valley, Foremost, Bow Island and Jumping Pound, and he wrote the figures down to show that the reserves were there. He pointed out in his testimony that very shortly, in a very few years, even with Jumping Pound, an additional supply would be required.

A Yes?

A Now, your next closest big supply is Pincher Creek. Presumably you do not need all of Pincher Creek for Canadian Western for some time?

Q That is right?

A Just as at the present time you do not need all of Jumping Pound.

Q Yes?

A For Canadian Western.

Q Yes?

A Now, by combining export with the requirements of Canadian Western, both of those reserves can be shared.

Q I understand the economics of it.

A The economics of it can be improved.

Q Yes, I understand that, but it is ultimately going to result in having no economically recoverable gas adjacent to Calgary, and at the same time having lots of it adjacent to Edmonton.

A No, I do not think you can say that, because if you will note here in this table that Edmonton reserves at the end of 30 years are in very much poorer shape than the reserves in the Southern part of the Province.

Q Is that so? Perhaps it isn't as bad as I thought?

A At the end of 30 years out of the 842 available marketable gas in Viking-Kinsella, Edmonton will have used up 718.4,





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and I think if you will go down here, I will take the extreme case, go down to Pincher Creek, of the 1252 available marketable gas only 683.7 has been removed, so that you are in a better position in 30 years than Edmonton.

Q That is very encouraging. I will put it the other way, if my first one won't stand up. Edmonton, the Northern system, will be in the same position in 30 years with reference to recoverable reserves?

A Yes.

Q And the Southern distribution system will be in a much worse position, not to price but to actual available reserves?

A I wouldn't say that because if export transpires and Canadian Western takes gas from the export gathering system, then they are hooked into an integrated gathering system and would have supplies over and above the Jumping Pound and Pincher Creek. Now, I also point out to you, Mr. Fenerty, that with export in the not too distant future, the Canadian Western system will be getting all of the gas from Pincher Creek and Jumping Pound.

Q Yes, that is right. As you say, you have not concerned yourselves how those costs are going to be, maybe more or less, you think there is a possibility it might be less?

A Yes, I think there is a distinct possibility of that.

Q Tell me one thing now, I might be getting into the economics, but I take it that won't worry you as much as it does me, perhaps, if you are going to integrate these systems in the way that you speak of, should there be integration of price?



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A I am not prepared to say on that.

Q I was wondering if you had any views on that?

A No.

Q All right. Now, you are not in a position to say that contracts are available or can be made available to carry out this plan you have suggested here?

A No, I am not in that position.

Q Thank you.

THE CHAIRMAN: I think we will adjourn for a few minutes.

(Hearing resumed after short adjournment).

THE CHAIRMAN: Any questions?

MR.NOLAN: No questions.

MR. C. E. SMITH: I have two or three questions, sir.

THE CHAIRMAN: All right.

.....

CROSS-EXAMINATION BY MR. C. E. SMITH:

Q Dr. Hetherington, I am the only one in this room that did not understand you and Mr. Fenerty when I think you agreed on a proposition. And if I understood both of you correctly, taking the last 30 years of the 50-year period, you said, as I heard it, that there would be gas available to supply Provincial requirements but that it was not deliverable. Did I understand both of you people correctly on that?

A That is essentially saying it in plain language, I guess.

Q Now, I just cannot follow that, if it is available and not deliverable, why?

A Well, it is in the ground, but it cannot be gotten out fast





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enough to meet the peak day that you will probably have by that time.

Q You do not suggest that none of it could be got?

A No, not large quantities that peak days could be met during that period.

Q I think in fairness to you we all understand that quite a large proportion could be delivered?

A A large part of it could be gotten out.

Q But it is not something that is left in the ground and not deliverable at all?

A No. And it might be by the use of storage that most of it could be gotten out. I haven't carried this beyond 30 years.

Q All right, that helps me in any event. You heard Mr. Brownie, I think you were here, weren't you?

A Yes, I was.

Q And you made reference yourself to statement "C" in Exhibit 42, that is that yellow exhibit, this one here (indicating), submitted by Canadian Western?

A Yes.

Q And if you will look at Exhibit "C", and at the total as suggested by Mr. Brownie, you see he suggests 78 billion four hundred million, or however you people read these big words, you see what I am getting at, and on his method of trying to make an estimate or a calculation for the 50-year period, he agreed with me that that would come to something like 4 trillion cubic feet that would be required for the Province? Multiplying 50 times 78,400 is awful close to that?

A Yes.



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Q Is that correct?

A Yes.

Q And with respect to the 30-year requirements for the Province as indicated by Statement "C" of Exhibit 42, it would be somewhere around 2 trillion 352 billion? Don't accept that, Dr. Hetherington, as I cannot add two and two together.

A That is for 20 years?

Q 30 years?

A 30 years.

Q 30 times the same amount?

A That is pretty close.

Q Well, that is close enough for us. Is that the figure that you said that you took into consideration when preparing this Exhibit 99, and particularly your summary in the long sheets?

A Not exactly, Mr. Smith. I took, and it is in the title of this exhibit, "Schedules for Gas Production for Provincial and Export Pipe Lines." Now, I considered the pipe line systems, which are the Canadian Western, the Northwestern Utilities and Westcoast Transmission Company export systems. Mr. Sample, in a previous exhibit, showed an allocation of the gas for the remainder of the Province, which is this 7 billion cubic feet. I did not include that 7 billion, which is presently served communities in the remainder of the Province.

Q Nor would it follow, Doctor, that you would not include then the latter part of Mr. Brownie's Statement "C"?

A That is correct. And it does not mean that that gas is not available, it just means that that would come from other sources than I have indicated in this table.



Dr. C. R. Hetherington,  
Cr. Ex. by Mr. C.E. Smith

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Q Let me refer you to my 30-year figure of 2 trillion, 352 billion, and that is based on Mr. Brownie's statement "C"?

A Yes.

Q If that were referable to the second last column in your summary, it would not leave a terrible amount for the Westcoast, would it? You could probably figure it exactly?

A I would like to point out there that the only difference between my schedule and Mr. Brownie's statement "C" is this figure for the remainder of the Province and the Province generally. Now, geographically those are located away from the gathering system of the Westcoast Transmission Company and would be supplied by other sources than listed in my submission.

Q Well, let me get back to my original question. If you take even your 30-year Provincial requirements as shown by Mr. Brownie's statement "C", from your 30-year production, you would have 3.572 or, at least, 3,572.4 less 2352, is that correct?

A Yes.

Q Which would leave a little over a trillion?

A I would like to make this thing clear. You are subtracting requirements. This 2352 requirement would come from fields other than I have listed in my submission.

Q What do you mean by that?

MR. McDONALD: Medicine Hat.

A Medicine Hat, for example, and I cannot remember all of them. There is Brooks.

Q Vermilion?

A Vermilion, and several others, several other communities which are called "remainder of the Province and Province





Dr. C. R. Hetherington,  
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generally", that would be supplied from sources other than the ones I have listed here.

Q MR.C. E. SMITH: You are talking about presently served communities in Statement "C"?

A Yes.

Q But you still have for Province generally additional possibilities, is that correct?

A Yes.

Q Which we should separate?

A Yes.

Q So that the 7, whatever it is, would not be too effective in the long run, would it? All I am getting at is this, if you use Mr. Brownie's Statement "C", I am wondering if you have got enough left for yourself to even operate on?

A Yes. The reason principally is that the, well, let us look at Mr. Brownie's statement "C". He has 7 billion a year for the remainder of the Province from presently served communities. Those presently served communities are served from local fields.

Q Which are not included?

A Which I have not assumed in my figures.

Q Yes?

A They also have under "Province generally" additional possibilities, towns not presently served, 1 billion.

Q Yes?

A Now, the towns not presently served are not presently served because they are not near a pipe line system.

Q That may be one reason, yes.

A I think Mr. Brownie has pointed out in his estimates that he is including the towns that are close to his system.



Dr. C. R. Hetherington,  
Cr. Ex.by Mr. C. E.Smith

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Q Which is not very large?

A Yes, it is not very large, and would have a very small effect upon the results of my exhibit here.

Q What I mean is, his estimate is not very large?

A No, and he has included provision for other industrial enterprises of 3 billion.

Q The provision for other industrial enterprises is only 3, whatever it is?

A I don't know what he means. He has additional possibilities in both the Calgary or Canadian Western system, he has additional possibilities in the Northwestern system.

Q Yes?

A Now, I assumed when I read this, that the provision for other industrial enterprises was other industrial enterprises besides that in the two pipe line systems.

Q Already mentioned above?

A Yes, already mentioned above.

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Dr. C. R. Hetherington,  
Cross-exam. by Mr. C. E. Smith.

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Q I am saying you probably agree with me certainly in your opinion he has not exaggerated on his 3 billion, I think it is, for other industrial enterprises, surely. One good cement plant at Exshaw could probably take care of that in itself.

MR. McDONALD: That is included in Canadian Western's estimate.

MR. SMITH: I do not think it is.

A The Banff-Exshaw requirements are included in the Canadian Western at 2.5 billion annually.

Q Then we will put the industry somewhere else. All I am getting at is you would not complain if Mr. Brownie had said instead of 3, he had said 13?

A I would not have any basis to complain.

Q You would not complain with his estimate if he had that much higher than 3 for other industries?

A I would want to think it over and look into the situation for additional industries outside of Canadian Western and the Northwestern areas.

Q Just one other question, where you refer here to new discoveries, if I understood you correctly, that your new discoveries 158.8 - you will observe the last line of your summary there?

A Yes.

Q You are simply there trying to suggest that would be the amount required. You are not suggesting that is the maximum discoverable?

A No, that is the amount required.

Q You do not suggest that there may not be a great deal more new discoveries than that?



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Cross-exam. by Mr. C. E. Smith.  
Exam. by The Chairman.

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A I think that is so. Dr. Nauss, in the interval between the recess here, has found more gas than that.

Q I do not bother with what he found in that interval. I am not sure he found it in such a way that we could put it in one of these columns anyway or one of the categories I refer to. Just one other thing. Your allocation of Jumping Pound to Canadian Western, as I remember it, does not occur until 1958. In other words, the first time you gave Canadian Western anything from Jumping Pound in your summaries or schedules here is in 1958. Would your explanation this morning with respect to Jumping Pound or Pincher Creek cover what I have in mind?

A Yes, it does.

Q There is no particular significance then by saying that Jumping Pound will not be available, according to this, to Canadian Western till 1958, in view of the fact Mr. Brownie suggested he would like it a lot sooner?

A No. It simply shows gas coming from Pincher Creek and as I pointed out because the pipeline passes close to Calgary. It might just as well come from Jumping Pound.

Q And that is the reason I think you gave before?

A Yes, it is.

Q Really this allocation with respect to Jumping Pound and Pincher Creek during the first portion of these schedules might be reversed?

A Might be reversed, yes.

EXAMINED BY THE CHAIRMAN:

Q Dr. Hetherington, can you give us a breakdown of that figure of 3 trillion 572 billion as between export and Alberta requirements?



Dr. C. R. Hetherington,  
Exam. by The Chairman.

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- A I would have to add that up in the fourth column of each individual sheet for the purpose entitled "Average Daily Dry Gas". The total is shown for each field and that was used to compute - -
- Q Yes, I know, but I just wondered if you happened to have it?
- A I do not have that split. I could get it for you.
- Q I think you did tell us what you had included in Foremost. Would you mind telling me again the fields included in the Foremost field?
- A Foremost includes the field that Dr. Nauss called Foremost and in the 30th year has signified by Note A "Denotes California Standard area," of Foremost. I point out in that respect 11 wells shown are in the California Standard area and on the previous sheet 6 wells are shown, the 6 being in addition to those 11, which would be in the Foremost area. That is the only case that such an explanation is necessary in any of the other fields.
- Q On these new discoveries, with particular reference to the Pendant d'Oreille and one or two of those other southern fields, I take it you would say those are out of economic reach of a line at the present time?
- A Other fields were more suitable for the purpose of showing this 30 year deliverability schedule. And if you will recall Mr. Sample made certain allocations as to various fields that Westcoast might take gas from, and I have stayed with that allocation.
- Q You are going to give us the deliverability - -
- A We have those now.
- MR. McDONALD: Yes, we have them. We have had charts prepared for the Pendant d'Oreille and Princess fields.





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Exam. by The Chairman.

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We have not prepared a Table. Do we need a Table to go with them?

A There might be some advantage to stapling them all together.

Q THE CHAIRMAN: We can get it later?

A Yes.

Q I wondered whether there was any significance by reason of the fact that those fields were left out of the schedules, especially Pendant d'Oreille which has such an appreciable reserve according to Dr. Nauss' evidence and one or two of those other smaller pools?

A These fields were not considered for - or not included, rather, for several reasons. First, I wanted to stay with Mr. Sample's allocation of fields from which Westcoast might take gas, and secondly, the Pendant d'Oreille and the Princess fields offer additional reserves for Southern Alberta irrespective of export.

Q Mr. Fenerty will find out there is enough gas after all?

A He may.

Q MR. McDONALD: There is one other point, Dr. Hetherington, with regard to that. There is a reference in Mr. Brownie's evidence to the fact that the capacity of the Canadian Western's system in that area is 46 million a day?

A Yes.

Q And the use of those fields would require entirely new pipeline facilities?

THE CHAIRMAN: Would this gas be connected with the same system as your Foremost wells? Would they tie on to that?

A Mr. Brownie says the capacity of that system is 46 million and it is already loaded, so that the use of those fields



Dr. C. R. Hetherington,  
Cross-exam. by Mr. Frere.  
" " " Mr. Smith.

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would require new pipeline facilities.

CROSS-EXAMINATION BY MR. FRERE:

MR. FRERE: I have a question or two, Mr. Chairman.

Q I have not a copy of Exhibit 99, Dr. Hetherington, but would you mind telling me this, do the peak day requirements of the Westcoast Transmission Company indicated in Exhibit 99 take into account the supplying of gas for consumers in the vicinity of Trail, British Columbia and Spokane and Hanford, Washington?

A Mr. Sample presented that market estimate and he did not include gas for those cities.

Q It is my understanding that the Westcoast Company has got tentative plans for supplying those cities and industries there?

A Yes.

Q That is your understanding?

A That is my understanding.

Q Is it your understanding that at sometime during the proceedings before the Board the Westcoast Company will make known whether or not it will be able to supply Trail, British Columbia with gas and particularly the plant of the Consolidated Company there?

A I cannot answer that question, I am sorry.

Q MR. C. E. SMITH: Might I ask one other question I had overlooked? Dr. Hetherington, in exhibit 50- I am not sure whether this is yours, I imagine it was Mr. Sample's preparation - "Relation of Proven Natural Gas Reserves in Alberta to Existing and Estimated Markets"?

A Yes.

Q You are pretty familiar with that?

A Yes.





Dr. Hetherington,  
Cross-Exam. by Mr. Smith.

" " " Mr. Nolan.

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Q On page 1 of that we have certain allocations to certain estimated requirements, which include pretty much what you have here?

A Yes.

Q Province of Alberta, the Northwestern Utilities, The Canadian Western Natural Gas, other local systems, the Westcoast Transmission system and Unallocated, but there is one significant omission in yours, and I am not saying that critically, but something that is not in yours and is included in that, and that is the Saskatchewan-Manitoba line, 650 billion cubic feet. Is there any significance in it being in Exhibit 50 and not in Exhibit 99?

A I was not involved in that particular line and as I pointed out, the fields from which the Westcoast Transmission Company would take gas do not conflict with the fields shown in the statement for the Saskatchewan line by Mr. Sample - -

Q In any event you think that is the reason why it would not be included in yours and was included in Mr. Sample's submission, Exhibit 50, although there is no suggestion in what you have just said and there is nothing to show that they need a Saskatchewan-Manitoba line, whatever that is I do not know, or if they need 650 billion for 25 years, it has no effect on your summary in Exhibit 99 at all, is that your idea?

A That is my idea because of the particular fields that I have shown gas being taken from.

CROSS-EXAMINATION BY MR. NOLAN:

Q MR. NOLAN: If I may ask Dr. Hetherington one question arising out of what you were asked by counsel for the Consolidated. Did I understand you to say that there were tentative plans for Westcoast to serve Spokane, Hanford



Dr. Hetherington,  
Cross-Exam. by Mr. Nolan.

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and Trail?

A My information on that is the bulletin I believe put in evidence that shows a tentative line considered to Trail. I believe it is in one of the submissions, I am not sure about that.

Q You are speaking about that brochure that has the dotted line on it?

A I believe that is right.

Q Issued by the Westcoast?

A That is correct.

Q Where were they going to get the gas for that?

A I have not been involved in that, Mr. Nolan.

Q I do not think any of us have, Dr. Hetherington, because I have not heard anything about plans or markets or costs for serving either Trail, Spokane or Hanford in this application?

A It is not in this application.

Q Is it going to be?

MR. McDONALD: I might intervene, sir. There has been no statement of that kind and will not be as far as I know in regard to this application.

MR. C. E. SMITH: That is what Mr. Frere is looking for. I mean, looking for information.

MR. McDONALD: The only information I know is that which was referred to by Mr. Hetherington and it is in the brochure. It is tentative. It is very, very tentative. I have no instructions in regard to it.

MR. NOLAN: Do I understand Mr. McDonald to say that so far as this application is concerned there will be no evidence led as to the feasibility of constructing a branch line to Trail, Spokane or Hanford?



Dr. Hetherington,  
Cross-Exam. by Mr. Nolan.  
Exam. by Dr. Govier.

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MR. McDONALD:

Those are my present instructions.

EXAMINED BY DR. GOVIER:

Q Dr. Hetherington, I wonder if I might ask you a question in connection with your Exhibit 99. You explained to us that on page 1, the column the third from the end refers to the open flow capacity of a typical well in terms of raw gas and that the number appearing in that column is taken from the chart?

A Yes.

Q I think also you said except in the case of Pincher Creek and Jumping Pound the allowable which appears in the second from the last column was taken at not more than 25% of open flow and reduced over to dry gas?

A Yes.

Q But in the case of Pincher Creek and Jumping Pound it was not more than 20%?

A Yes.

Q I believe in the case of Pincher Creek you indicated that the factor which you had used for converting from wet gas, I should say raw gas, to a dry gas basis was an 80% factor?

A That is correct.

Q Did you intentionally use a different factor there than the 70% factor used by Dr. Nauss in Table A?

A Yes, it was intentional in that the two factors are different. Dr. Nauss' 70% includes certain gases that will not be able to be produced as a result of abandonment pressures higher than 400 pounds and as a result of mechanical trapping in the reservoir?

Q And the same situation exists with respect to Jumping Pound?

A Yes.

Q Does that exist in other cases also?





Dr. Hetherington,  
Exam. by Dr. Govier.

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A In the other cases that same thing exists because - well, take in the case of Foremost or Viking-Kinsella where the gas is dry gas I used the 100% factor in that the well production is dry gas and would be marketable.

Q I wonder if we might look at the charts for a moment, Dr. Hetherington. These charts form the basis for all the Tables that precede them, don't they?

A Yes. I point out in that respect that the second chart for each field was used in preparing the table. The chart entitled "Average well open flow - withdrawal characteristics". The previous chart provides additional information regarding well-head pressures under various flowing conditions.

Q Both charts reflect the same basic data?

A Yes.

Q And if we look, for example, at the first chart and discuss it then any comments we may make in connection with that would be applicable to the second chart also?

A Yes, that is right.

Q I wonder if you could tell me in connection with the chart of Foremost whether this chart was made up on test data, that is, actual back pressure tests of wells in the Foremost field?

A Yes.

Q Were there a number of wells tested, Dr. Hetherington, in this connection?

A I believe I had several tests on that. The information was furnished to me by Dr. Nauss of tests of wells in that area.

Q MR. McDONALD: What area is that?

A Foremost. The report is not available, it is in the hotel.

Q DR. GOVIER: That is all right. I wanted to know if this data had been obtained from wells and if there were more than one or two wells involved.



Dr. Hetherington,  
Exam. by Dr. Govier.

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Yes, I believe on Foremost I had three wells.

Q And back pressure tests on three wells?

A It was either two or three that I had information on. I know it was more than one.

Q Was that test data in your opinion good data, reliable data?

A It looked like rather good data.

Q And you process that together and averaged the value at the end and the average well characteristics, do you?

A Yes.

Q That is reflected in this first chart?

A Yes.

DR. GOVIER: Mr. McDonald, if that report that Dr. Hetherington has referred to is available at a later date it would be useful to us.

MR. McDONALD: Yes, we can file it. It was prepared by J. E. Langston for Dr. Hetherington and we will be glad to furnish it to the Board.

Q DR. GOVIER: Was the chart of Foremost prepared in the same way from actual test data?

A It was not, no.

Q What was the value at the end used then in this case?

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A The slope used was .88 with an open flow of 10 million cubic feet per day.

Q That was the measured open flow?

A The only information I had on Provost was that the wells were similar to the Viking-Kinsella wells and I used the same information that I had for Viking in the Provost. I had no additional data on Provost.

Q Not even open flow data, is that right?

A No additional open flow data, no.

Q So the chart for Provost is based on the assumption that the wells in that area will behave exactly as those in the Viking-Kinsella?

A Yes.

Q Is the formation pressure taken somewhere?

A No, I had a measurement on the formation pressure. I had a measurement on the formation pressure, I had information on the temperature from Dr. Nauss, and the depth from Dr. Nauss.

Q Would you care to comment on what you think the reliability of this chart might be?

A Well, it is only good for estimating purposes. I would say that if the formation is the same as in Viking that it could be representative.

Q On the next chart, Dr. Hetherington, which refers to Viking-Kinsella, I assume that that was based on the average of a large number of tests ?

A I had a great amount of data on Viking.

Q And you would put considerable faith in this particular field?



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A Well, I would put considerable faith. I think the thing is conservative. In fact, it is very conservative for peak load purposes for this reason, the Viking-Kinsella wells are tested for a short period of time, then based on longer tests made those are converted to what they call 10-day deliverability. Now, I am telling you something you know, but they are converted to the 10-day deliverability or 10-day open flow. In Viking-Kinsella the wells decreased about 50% in their open flow before they levelled off, so that a well that would have a 17 to 20 million cubic feet per day open flow on the original short tests whatever it is, a 3-hour test, would decrease then down to 8 or 10 million cubic feet per day as the sustained open flow after 10 days withdrawal. Now, the Viking-Kinsella field has to be determined upon as a peak load field and yet this chart is based on a base load draw from the field and I rather believe that the open flow suitable for peak load withdrawals there would be considerably greater than the 10 million cubic feet a day I have estimated here.

Q I see, this chart is based on the sustained characteristics of the pool, is it?

A Yes, it is, and I have information in answer to my request of the Northwestern Utilities that the average open flow in the Kinsella part of the field is about 17 million a day. The answer I got from analyzing the day was 10 million feet a day sustained, and I rather believe they refer to the short term open flow.

Q Before we look at the next chart for Pincher Creek,





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Dr. Hetherington, I wonder if you would look at Exhibit 80 with me, please. Do you recall the last time we discussed the deliverability chart for Pincher Creek, the data which is now shown on Exhibit 80 was not available. I would like to ask, Dr. Hetherington, and first, I assume that the chart, the deliverability chart, was based on the data that appears in Exhibit 80. Is that right?

A Yes, I believe it was. Dr. Nauss had that information when he gave me the figure of 70 million cubic feet per day open flow.

Q The figure of 70 million cubic feet per day then is Dr. Nauss' interpretation of Exhibit 80, rather than yours, is that right?

A Well, I am calling on my memory. I think that is right.

Q Perhaps we might now get your interpretation of Exhibit 80, Dr. Hetherington. Looking at the data, what would be your opinion of the reliability and the likely accuracy of the data in Exhibit 80?

A Well, the data, of course, leave a lot to be desired but they can be looked at in several ways. Now, I went through much the same maneuvers that you went through this morning and in nearly every case I came up with an open flow of greater than 70 million. For example, if the point in curves 1, 2 and 3 are averaged I get for that unacidized well condition 25 million cubic feet per day. Now, if the same slope is used as the average of those points and is drawn through the lower point on curve 4, I get for the acidized wells 200 million cubic feet per day, which, if you want to





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take a straight average, is something over 100 million cubic feet per day open flow.

Q That assigned a considerable amount of importance in weight to the single point on curve 4?

A I think too much weight.

Q Would you continue, Dr. Hetherington, with your interpretation of this? You think that is too much weight. What would you think the right weight, the best weight?

A Well, let me speak with respect to the slope first. This curve No. 1 here is, as you point out, an unusual slope for a gas well. On the other hand, analyses by the U.S. Bureau of Mines show that out of 800 and some gas wells tested they had 200 and some of the wells with a slope of 100, with 1 about 1.2, but it fell off fast after that. Between 1.2 and 1.4 there were only 30 wells, and they point out in the discussion there that the wells that showed a high slope also produced liquid, and the only thing I can associate with that is a well that produces liquid must have some liquid formation in the reservoir which retards the flow and makes the slope greater than .85, which would be expected for a dry gas well. It is hard for me to apply curves 2 and 3, the slope in those curves. I think it would be optimistic to assume that the slope would be that good. I think the slope measures out around 6/10ths for those curves. I had fairly good information on Jumping Pound and the average slope came to about 1.15, so using the slope of 1.15 seemed fairly reasonable for Pincher Creek where the reservoir conditions -- well, they are



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relatively the same, both of the fields are going to produce some liquid.

Q Did you say, Dr. Hetherington, that you felt a slope of 1.15 was more conservative than a slope of .60?

A Yes.

Q Now, that would be true for the anchor point, so to speak, with absolute open flow?

A My anchor point has been absolute open flow.

Q But those are the very things that have not been measured.

A Let me put it this way, that my anchor point has been the original open flow. Now, true, in the determination of the original open flow the converse is true as to which slope is conservative. I will agree with you on that.

Q In any event, in your opinion, despite the shortcomings of the data shown in Exhibit 80, you feel that an absolute open flow of 70 million and some odd with a slope of 1.15 in the line starting from the 70 million point is reasonable for these wells?

A Yes, I think it is reasonable, and I base that primarily upon curve No. 1, there. That looks to me to be the test of all the data, and that is on an unacidized well. Now, acidization generally gives a marked improvement in the well, particularly where they are drilled in with a rotary. Now, if the well produces 45 million cubic feet per day open flow before acidization, it is certainly probable, based on acidization performance of other wells, that it will produce 70 million after treatment. The curve No. 4, the one point that is available for





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curve No. 4, shows the definite and marked advantage of acidizing those wells, even if, as you point out, the point in curve 4 were an inch higher on the paper, it still shows the great advantage of acidization. So I believe that while 70 million a day can not be depended upon as a definite figure, it is a reasonable figure.

Q I suppose then it might be anywhere from perhaps 40 to 100 million cubic feet a day. Would it be reasonable to assume that?

A No, I would think that 45 would be about the minimum.

Q You would put a considerable amount of confidence in the test on Pincher Creek No. 1, I take it?

A Yes, I would.

Q In spite of the fact that the sand face pressures were calculated and the necessary corrections to be applied to the well head pressures was of the order of 15 or 16 hundred pounds. Do you still feel that way?

A Yes. May I ask in that regard if it was my understanding that curves 2 and 3 were also calculated?

Q I believe they were, yes. That is my understanding. Well, that is all, Dr. Hetherington, as far as that is concerned. And the deliverability chart in your Exhibit 99 is then based on the open flow of 70?

A Yes.

Q And a slope of 1.15?

A Yes.

Q And in the case of Jumping Pound, the chart is based on the average data as shown in - - did we have that marked as an exhibit?



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Exam. by Dr. G. W. Govier.

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MR. McDONALD: Exhibit 81, sir.

Q DR. GOVIER: Is that right, Dr. Hetherington,  
it is based on the average shown at 81?

A THE WITNESS: Yes, it is.

Q Would you care to comment on the reliability of this  
Jumping Pound data in 81?

A I think the data are exceptionally good back pressure  
data. We have the data point and the calculations by  
Shell. I will be very happy to provide those, if you  
would like to have them.

Q Yes, I think we would. What about Stettler, Dr.  
Hetherington, were these charts based on test data?

A In Exhibit 37 I gave the information that I had in regard  
to Stettler. This information was received from Dr. Nauss  
and it was based on measured depths, measured temperature,  
measured bottom hole pressure, and with respect to the  
open flow it was either measured or estimated and I think  
Dr. Nauss could tell us which one.

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Q MR. McDONALD: Which is that?

A Stettler.

DR. NAUSS: It was measured.

A It was a measured open flow, I believe, with a Pitot tube, with an average open flow.

Q DR. GOVIER: It was a measurement of one well, was it?

A I have to get that information from Dr. Nauss.

MR.McDONALD: We will have to check that.

Q DR. GOVIER: All I was driving at, Dr. Hetherington, was to see how much data might have gone into the preparation of this chart, and whether it is a measurement of more than one well or just one well, or if Dr. Nauss can give it to us later, that will be fine.

A Yes, and he may have to do it in other cases, because I took his figures as shown in Exhibit 37 for the open flow of these various fields.

Q You assumed the slope for the Stettler chart, did you?

A Yes, I did.

Q Wasn't that 1.15?

A No, I used a lower slope in Stettler. I used a slope of 1.0, because that gas is an essentially dry gas. In that regard, Dr. Govier, I would summarize this thing by saying where I had information as to the slope of the wells, I used that slope; where I did not have any information as to the slope for the dry gas fields, I used the figure of 1.0 in an attempt to be conservative. In the one condensate field, Jumping Pound, or in the one liquid producing field, Jumping Pound, I had this information of 1.15 as to the slope, and I used that same figure in Pincher Creek.





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Q Perhaps, Dr. Hetherington, those comments will cover Athabasca, I assume they do?

A Yes.

Q And Boyle?

A Yes.

Q And Lac la Biche?

A Yes.

Q And Bailey Long Island?

A Yes.

Q And I think we discussed Picardville and Morinville before?

A Yes, we did.

Q There has been no supplementary data in the case of Picardville and Morinville?

A No.

Q These are the same charts?

A Yes, they are.

Q That is all I have, Doctor, I think.

THE CHAIRMAN: Now, is there any other evidence that you want to present just now, Mr. McDonald?

MR. McDONALD: The position, sir, is that the last exhibit filed on the close of the Hearing on February 17th was with regard to the natural gas industry in Alberta, and I would like Dr. Hetherington to deal with that very shortly in the morning.

MR. C. E. SMITH: What is that number, Mr. McDonald?

MR. McDONALD: Exhibit 77. Now, that is the only thing I was going to ask him about, and that is all the evidence I have to submit at this particular week. I do not want to detain the Counsel and all the other parties for another day, but I thought that there might be further



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examination of Dr. Hetherington by other Counsel.

THE CHAIRMAN: I was wondering if any of the other Counsel wanted to conduct any other examination?

MR. NOLAN: We have nothing, sir.

MR. McDONALD: There is this other thought, sir, that there is a matter that we wish to enlarge on subsequently, and that is the question of the sulphur content of the gas, and the disposition of it, and consideration has been given to the submission of evidence in regard to it, and there are other matters too that we wish to deal with, particularly matters raised by Mr. Fenerty, and I was going to suggest that this application should be adjourned until the date of the Interfield, the date upon which the Interfield exhibit, which is filed in this application, might be dealt with by officials of that company, and, subsequently, adjourned to a date in October, having regard to the further submissions in regard to reserve of the application.

THE CHAIRMAN: Well, this statement by Interfield is not really an application of its own. You are going to deal with it when the Northwest application is heard, Mr. Mahaffy?

MR. MAHAFFY: Mr. Chairman, the last arrangement was that in view of the fact Mr. Milner is out of the country, that we would go on, instead of now, on the application of the Northwest case in June, whenever that might be. As you quite properly point out, this is not a separate application, it is just a submission, which, as Mr. McDonald said, was put in this particular proceeding, and as far as we are concerned, we really do not care when it comes in,





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as long as it comes in.

THE CHAIRMAN: It is pretty hard to set a date of an application we have not got.

MR. McDONALD: I think the matter could be resolved by adjourning this Hearing until Monday, June 12th.

MR. C. E. SMITH: June what?

MR. McDONALD: June 12th. If that would meet the Board's convenience.

MR. C. E. SMITH: What are you going to do on June 12th, Mr. McDonald?

MR. McDONALD: If the information regarding the problem with regard to sulphur is available at that time, we would proceed with it, if not, we would have to ask for a further adjournment.

THE CHAIRMAN: Mr. Nolan, how long do you think you might take on May 29th? Do you think you would be through in two weeks?

MR. NOLAN: My instructions are, sir, that we can finish in two weeks, but, of course,...

MR. C. E. SMITH: I would like to make a book on that.

MR. NOLAN: Well, of course, you can defeat me by cross-examining, Mr. Smith.

MR. C. E. SMITH: I haven't bothered anybody very much yet.

MR. NOLAN: That is always subject to the length of the cross-examination. We think it can be completed in two weeks.

THE CHAIRMAN: Would you prefer to have it adjourned to June rather than have it all put over to October? Would you prefer to have a date in June, Mr. McDonald?



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MR. McDONALD: Well, October would suit us just as well. The only thing I had in mind was to keep the record clear as to the Interfield application, which has already been made in this matter.

THE CHAIRMAN: Yes.

MR. McDONALD: You can make it June or any other time.

THE CHAIRMAN: Well, we will adjourn it then until the 12th of June, and then we could consider it <sup>then</sup> rig , and we could notify Counsel if we have to ask it to be adjourned.

MR. McDONALD: Yes, that would be quite satisfactory.

THE CHAIRMAN: In regard to closing off today now, are there any Counsel who wish to examine on this submission that Dr. Hetherington can present now. We could sit tomorrow, or, if you would like to stay, we could hear it now.

MR. McDONALD: It can stand over.

THE CHAIRMAN: We can adjourn until tomorrow morning and hear it, if you like, or whatever Counsel would like to do.

MR. McDONALD: It is not a contentious point, sir, and it would be quite all right to take care of it in June or in October, or November, when we finally wind up our case.

MR. C. E. SMITH: If that be so, I would suggest, sir, that we adjourn now until June 12th insofar as this particular application is concerned. There is no need to sit in the morning for half an hour or an hour unless the Board wants to do so.





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THE CHAIRMAN: In that case we will adjourn until June 12th.

MR. C. E. SMITH: Somebody has just brought this to my attention. In view of Mr. Fenerty's remarks about the Board's technical men being called, you were going to sort of formally announce it at tomorrow's adjournment, and I take it that tomorrow's adjournment is now going to be today.

THE CHAIRMAN: The reason I mentioned tomorrow is that we have received another application for a permit, of which notification has appeared in the Press, but we notified the M.L.A.s today that we would hear the application of the Prairie Pipe Lines on October 9th. We understand that the Western Pipe Lines will apply for an adjournment on June 19th until September 25th. So that it looks to us now that if we hold a joint session of all the applicants to hear the Board engineers, and any other evidence that the Board may wish to put in, that it will be some time around the end of October. We will fix a date for that later on, but it will be some time about the end of October.

MR. NOLAN: Do I understand, Mr. Chairman, that the Board will sit on Monday morning, the 17th?

THE CHAIRMAN: Yes, we have to be here anyway.

(The Hearing adjourned until June 12th, 1950.)











